Hopping hoop

| Report date | Dec 25, 2023, 1:07:05 PM |

Contents

1. Global Definitions

Global settings

Name	Hopping hoop.mph
Path	C:\Users\mayan\Downloads\hopping_hoop.mph
Version	COMSOL Multiphysics 6.2 (Build: 290)
Unit system	SI

Used products

COMSOL Multiphysics
Multibody Dynamics Module

Computer information

1.1. Parameters

Parameters 1

Name	Expression	Value	Description
Rc	1[m]	1 m	Ring radius
mu	1	1	Coefficient of friction
v0	0.1[m/s]	0.1 m/s	Initial velocity
omega0	v0/Rc	0.1 1/s	Initial angular velocity
gamma	0.75	0.75	Mass ratio
mtot	1[kg]	1 kg	Total mass
t_end	10*pi*Rc/vchar	18.753 s	Simulation time
dt	Rc/vmax/36	0.0036191 s	Time step
lbase	10*pi*Rc	31.416 m	Length of plane
Wk0	mtot*v0^2*(1 + gamma)	0.0175 J	Initial kinetic energy
Wgmax	mtot*gamma*g_const*2*Rc	14.71 J	Available potential energy
vmax	sqrt((Wgmax/mtot + v0^2*(1 + gamma))/(1 - gamma))	7.6753 m/s	Max velocity
vchar	vmax - 6[m/s]	1.6753 m/s	Estimated mean velocity

2. Component 1

Settings

Description	Value
Unit system	Same as global system (SI)
Geometry shape function	Automatic

Spatial frame coordinates

First	Second	Third
x	y	z

Material frame coordinates

First	Second	Third

X	Y	Z

Geometry frame
coordinates

First	Second	Third
Xg	Yg	Zg

Mesh frame
coordinates

First	Second	Third
Xm	Ym	Zm

2.1. Definitions

2.1.1. Variables

Variables 1

Selection	
Geometric entity level	Entire model

Name	Expression	Unit	Description
Wg	g_const*mtot*((aveop1(y) - Rc)*gamma + aveop2(y)*(1 - gamma))	J	Current potential energy

2.1.2. Nonlocal Couplings

Average 1

Coupling type	Average
Operator name	aveop1

Selection	
Geometric entity level	Point
Selection	Geometry geom1: Dimension 0: Point 6
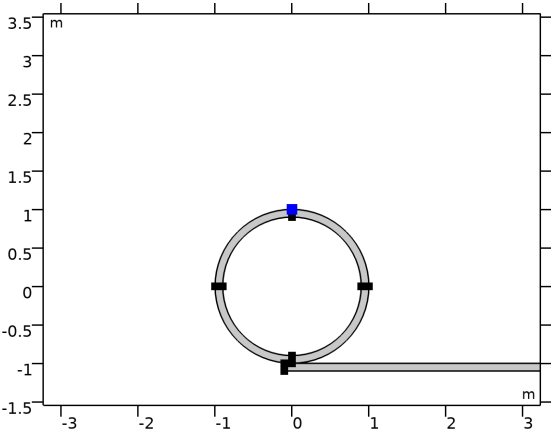
Selection

Average 2

Coupling type	Average
Operator name	aveop2

Selection	
Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 5–6, 9, 12
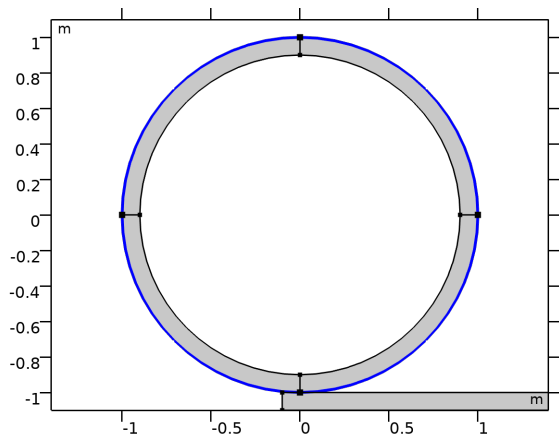
Selection

2.1.3. Coordinate Systems

Boundary System 1

Coordinate system type	Boundary system
Tag	sys1

Coordinate names

First	Second	Third
t1	n	to

2.2. Geometry 1
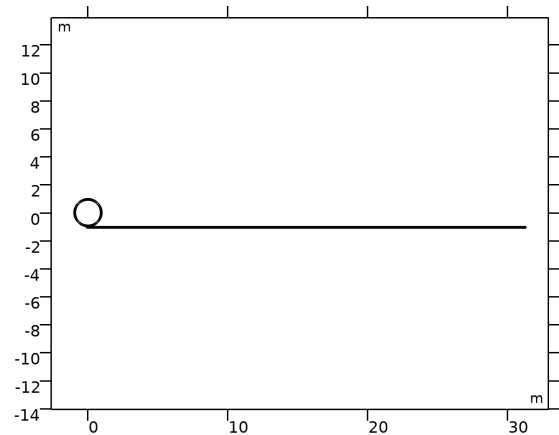
Geometry 1

Units

Length unit	m
Angular unit	deg

Geometry statistics

Description	Value
Space dimension	2
Number of domains	5
Number of boundaries	16
Number of vertices	12

2.2.1. Circle 1 (c1)

Position

Description	Value
Position	{0, 0}

Position

Layer name	Thickness (m)
Layer 1	Rc/10

Size and shape

Description	Value
Radius	Rc

Information

Description	Value
Last build time	Unknown

2.2.2. Delete Entities 1 (del1)

Information

Description	Value
Last build time	Unknown

2.2.3. Rectangle 1 (r1)

Position

Description	Value
Position	{-0.1, -1.1}

Size

Description	Value
Width	lbase
Height	0.1

Information

Description	Value
Last build time	Unknown

2.2.4. Form Assembly (fin)

Settings

Description	Value
Action	Form an assembly
Create pairs	Off

Information

Description	Value
Last build time	Unknown

2.3. Materials

2.3.1. Material 1
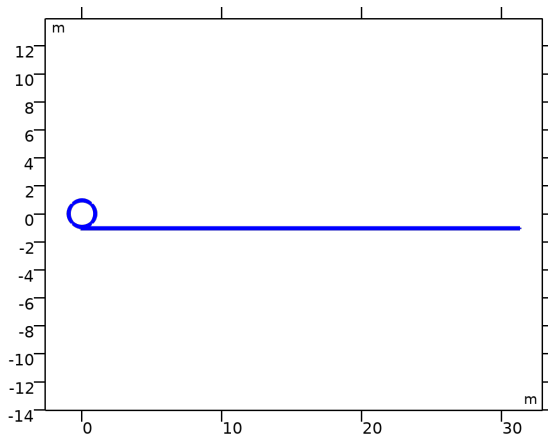
Material 1

Selection

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

Material parameters

Name	Value	Unit	Property group
Density	0	kg/m³	Basic

Basic

Description	Value	Unit
Density	0	kg/m³

2.4. Multibody Dynamics

Used products

COMSOL Multiphysics
Multibody Dynamics Module
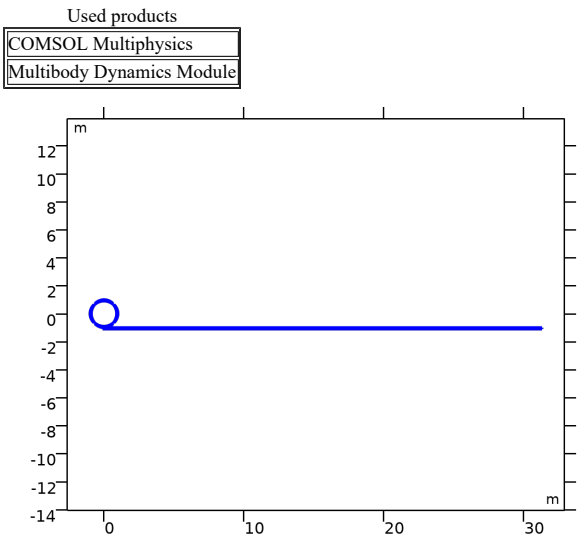
Multibody Dynamics

Selection

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–5

Equations

$$\rho \frac{\partial^2 \mathbf{u}}{\partial t^2} = \nabla \cdot (\mathsf{F}\,\mathsf{S})^{\mathsf{T}} + \mathbf{F}_V, \quad \mathsf{F} = \mathsf{I} + \nabla \mathbf{u}$$

2.4.1. Interface Settings

Physics Symbols

Settings

Description	Value
Enable physics symbols	Off

Discretization

Settings

Description	Value
Displacement field	Linear

Settings

Description	Value
Equation form	Study controlled

2D Approximation

Settings

Description	Value
2D approximation	Plane strain
Out-of-plane mode extension (time-harmonic)	Off

Settings

Description	Value	Unit
Thickness	1	m

Structural Transient Behavior

Settings

Description	Value
Structural transient behavior	Include inertial terms

Initial Values

Settings

Description	Value	Unit

Center of rotation, x-component	0	m
Center of rotation, y-component	0	m
Center of rotation, z-component	0	m
Displacement at center of rotation, x-component	0	m
Displacement at center of rotation, y-component	0	m
Displacement at center of rotation, z-component	0	m
Velocity at center of rotation, x-component	v0	m/s
Velocity at center of rotation, y-component	0	m/s
Velocity at center of rotation, z-component	0	m/s
Angle of rotation	0	rad
Angular velocity	-omega0	rad/s

Automated Model Setup

Settings

Description	Value
Rigid domains selection	From physics interface
Include mass and moment of inertia node	Off
Straight boundaries	Prismatic joint
Circular boundaries	Hinge joint

Results

Settings

Description	Value
Body defining reference frame	None

Joints Summary

Settings

Description	Value
Joints	

Rigid Body DOF Summary

	N	DOF	Prescribed	Constraints
Rigid bodies	2	6	0	3
Total	-	6	0	3
Net	-	3	-	-

2.4.2. Variables

Name	Expression	Unit	Description	Selection	Details
mbd.X	X	m	Material coordinates, X-component	Domains 1–5	
mbd.Y	Y	m	Material coordinates, Y-component	Domains 1–5	
mbd.Z	0	m	Material coordinates, Z-component	Domains 1–5	
mbd.X	X	m	Material coordinates, X-component	Boundaries 1–16	
mbd.Y	Y	m	Material coordinates, Y-component	Boundaries 1–16	
mbd.Z	0	m	Material coordinates, Z-component	Boundaries 1–16	
mbd.x	x	m	Spatial coordinates, x-component	Domains 1–5	
mbd.y	y	m	Spatial coordinates, y-component	Domains 1–5	
mbd.z	0	m	Spatial coordinates, z-component	Domains 1–5	
mbd.x	x	m	Spatial coordinates, x-component	Boundaries 1–16	
mbd.y	y	m	Spatial coordinates, y-component	Boundaries 1–16	
mbd.z	0	m	Spatial coordinates, z-component	Boundaries 1–16	
mbd.uf	u	m	Displacement field, X-component	Domains 1–5	
mbd.vf	v	m	Displacement field, Y-component	Domains 1–5	
mbd.wf	0	m	Displacement field, Z-component	Domains 1–5	
mbd.uf	u	m	Displacement field, X-component	Boundaries 1–16	
mbd.vf	v	m	Displacement field, Y-component	Boundaries 1–16	

mbd.wf	0	m	Displacement field, Z-component	Boundaries 1–16	
mbd.nX	nX	1	Normal vector, X-component	Boundaries 1–4	
mbd.nY	nY	1	Normal vector, Y-component	Boundaries 1–4	
mbd.nZ	0	1	Normal vector, Z-component	Boundaries 1–4	
mbd.nX	dnX	1	Normal vector, X-component	Boundaries 5–16	
mbd.nY	dnY	1	Normal vector, Y-component	Boundaries 5–16	
mbd.nZ	0	1	Normal vector, Z-component	Boundaries 5–16	
mbd.nx	nx	1	Normal vector, x-component	Boundaries 1–4	
mbd.ny	ny	1	Normal vector, y-component	Boundaries 1–4	
mbd.nz	0	1	Normal vector, z-component	Boundaries 1–4	
mbd.nx	dnx	1	Normal vector, x-component	Boundaries 5–16	
mbd.ny	dny	1	Normal vector, y-component	Boundaries 5–16	
mbd.nz	0	1	Normal vector, z-component	Boundaries 5–16	
mbd.nXmesh	nXmesh	1	Normal vector (mesh), X-component	Boundaries 1–4	
mbd.nYmesh	nYmesh	1	Normal vector (mesh), Y-component	Boundaries 1–4	
mbd.nZmesh	0	1	Normal vector (mesh), Z-component	Boundaries 1–4	
mbd.nXmesh	dnXmesh	1	Normal vector (mesh), X-component	Boundaries 5–16	
mbd.nYmesh	dnYmesh	1	Normal vector (mesh), Y-component	Boundaries 5–16	
mbd.nZmesh	0	1	Normal vector (mesh), Z-component	Boundaries 5–16	
mbd.nxmesh	nxmesh	1	Normal vector (mesh), x-component	Boundaries 1–4	
mbd.nymesh	nymesh	1	Normal vector (mesh), y-component	Boundaries 1–4	
mbd.nzmesh	0	1	Normal vector (mesh), z-component	Boundaries 1–4	
mbd.nxmesh	dnxmesh	1	Normal vector (mesh), x-component	Boundaries 5–16	
mbd.nymesh	dnymesh	1	Normal vector (mesh), y-component	Boundaries 5–16	
mbd.nzmesh	0	1	Normal vector (mesh), z-component	Boundaries 5–16	
mbd.d	1	m	Thickness	Domains 1–5	
u_ref	u	m	Displacement field, reference frame, x-component	Domains 1–5	
v_ref	v	m	Displacement field, reference frame, y-component	Domains 1–5	
w_ref	0	m	Displacement field, reference frame, z-component	Domains 1–5	
mbd.disp_ref	sqrt(u_ref^2+v_ref^2+w_ref^2+eps)	m	Displacement magnitude, reference frame	Domains 1–5	
mbd.x_ref	X+u_ref	m	Spatial coordinate, reference frame, x-component	Domains 1–5	
mbd.y_ref	Y+v_ref	m	Spatial coordinate, reference frame, y-component	Domains 1–5	
mbd.z_ref	0	m	Spatial coordinate, reference frame, z-component	Domains 1–5	
mbd.ut_ref	d(u_ref,TIME)	m/s	Velocity, reference frame, x-component	Domains 1–5	
mbd.vt_ref	d(v_ref,TIME)	m/s	Velocity, reference frame, y-component	Domains 1–5	
mbd.wt_ref	d(w_ref,TIME)	m/s	Velocity, reference frame, z-component	Domains 1–5	
mbd.vel_ref	sqrt(mbd.ut_ref^2+mbd.vt_ref^2+mbd.wt_ref^2+eps)	m/s	Velocity magnitude, reference frame	Domains 1–5	
mbd.diag	32.384087263246315	m	Bounding Box Diagonal	Global	

mbd.isGeomNon	1	1	Geometric nonlinearity variable	Global	
mbd.an	real(mbd.accX)*mbd.nX+real(mbd.accY)*mbd.nY+real(mbd.accZ)*mbd.nZ	m/s²	Normal acceleration	Boundaries 1–16	
mbd.RFtotalx	mbd.sumreaction(mbd.RFx)+mbd.RFfsx+mbd.RFfdx	N	Total reaction force, x-component	Global	+ operation
mbd.RFtotaly	mbd.sumreaction(mbd.RFy)+mbd.RFfsy+mbd.RFfdy	N	Total reaction force, y-component	Global	+ operation
mbd.RFtotalz	mbd.sumreaction(mbd.RFz)+mbd.RFfsz+mbd.RFfdz	N	Total reaction force, z-component	Global	+ operation
mbd.RMtotalx	mbd.sumreaction(mbd.RMx)+mbd.RMmsx+mbd.RMmdx	N·m	Total reaction moment, x-component	Global	+ operation
mbd.RMtotaly	mbd.sumreaction(mbd.RMy)+mbd.RMmsy+mbd.RMmdy	N·m	Total reaction moment, y-component	Global	+ operation
mbd.RMtotalz	mbd.sumreaction(mbd.RMz)+mbd.RMmsz+mbd.RMmdz	N·m	Total reaction moment, z-component	Global	+ operation
mbd.activation_multiplier	1	1	Activation multiplier	Domains 1–5	
mbd.geomsize	32.384087263246315	m	Bounding box	Global	
mbd.timestep	t-mbd.t_old	s	Time step	Global	
xt	d(x,TIME)	m/s	Mesh velocity, x-component	Global	
yt	d(y,TIME)	m/s	Mesh velocity, y-component	Global	
zt	0	m/s	Mesh velocity, z-component	Global	

2.4.3. Linear Elastic Material 1
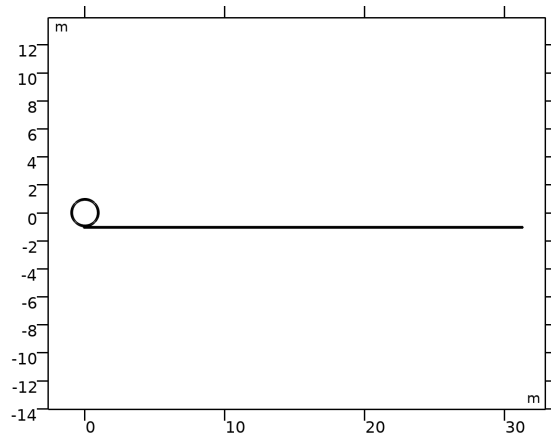
Linear Elastic Material 1

Selection	
Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

Equations

$$\rho\frac{\partial^2 \mathbf{u}}{\partial t^2} = \nabla \cdot \mathsf{S} + \mathbf{F}_V$$

$$\mathsf{S} = \mathsf{S}_{inel} + \mathsf{S}_{el}, \quad \epsilon_{el} = \epsilon - \epsilon_{inel}$$

$$\epsilon_{inel} = \epsilon_0 + \epsilon_{ext} + \epsilon_{th} + \epsilon_{hs} + \epsilon_{pl} + \epsilon_{cr} + \epsilon_{vp} + \epsilon_{ve}$$

$$\mathsf{S}_{el} = \mathbf{C} : \epsilon_{el}$$

$$\mathsf{S}_{inel} = \mathsf{S}_0 + \mathsf{S}_{ext} + \mathsf{S}_q$$

$$\epsilon = \frac{1}{2}\left[(\nabla \mathbf{u})^{\mathsf{T}} + \nabla \mathbf{u}\right]$$

$$\mathbf{C} = \mathbf{C}(E, \nu)$$

Linear Elastic Material

Settings	
Description	**Value**
Material symmetry	Isotropic
Specify	Young's modulus and Poisson's ratio
Young's modulus	From material
Poisson's ratio	From material
Density	From material
Use mixed formulation	None

Geometric Nonlinearity

Settings

Description	Value
Formulation	From study step
Strain decomposition	Automatic

Quadrature Settings

Settings

Description	Value
Reduced integration	Off

Coordinate System Selection

Settings

Description	Value
Coordinate system	Global coordinate system

Shape functions

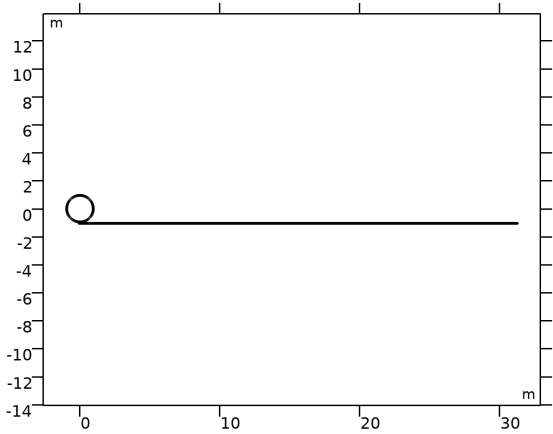| Name	Shape function	Unit	Description	Shape frame	Selection
u	Lagrange (Linear)	m	Displacement field, X-component	Material	No domains
v	Lagrange (Linear)	m	Displacement field, Y-component	Material	No domains

2.4.4. Free 1
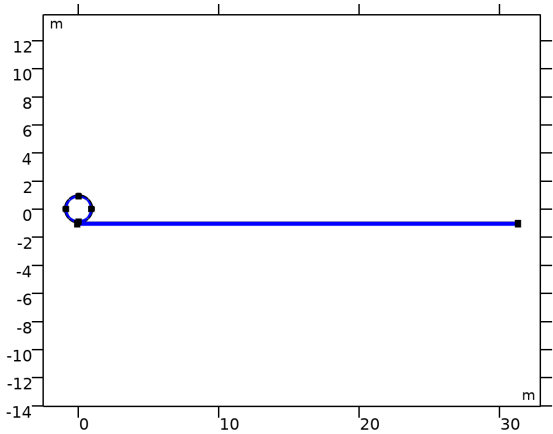
Free 1

Selection

Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: All boundaries

2.4.5. Initial Values 1

Initial Values 1

Selection

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

Equations

$$\mathbf{u}_0 = -\mathbf{r}\,(1 - \cos\phi) + (\mathbf{e}_z \times \mathbf{r})\sin\phi + \mathbf{u}$$

$$\left(\frac{\partial\mathbf{u}}{\partial t}\right)_0 = \left(\mathbf{e}_z \times (\mathbf{r} + \mathbf{u}_0 - \mathbf{u})\right)\frac{\partial\phi}{\partial t} + \frac{\partial\mathbf{u}}{\partial t} \qquad \mathbf{r} = (\mathbf{X} - \mathbf{X}_c)$$
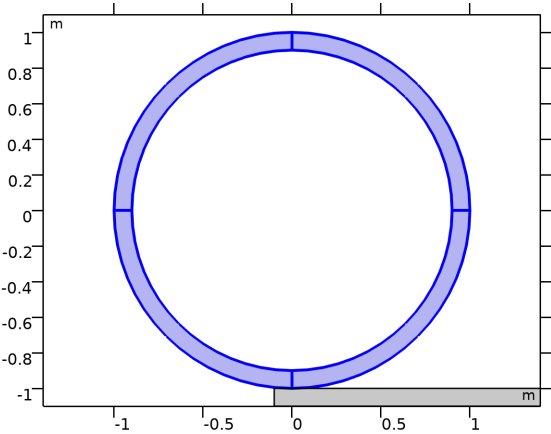
Initial Values

Settings	
Description	**Value**
Initial values	From physics interface node
Consistent initialization	Default

Coordinate System Selection

Settings	
Description	**Value**
Coordinate system	Global coordinate system

2.4.6. Rigid Body Contact 1

Rigid Body Contact 1
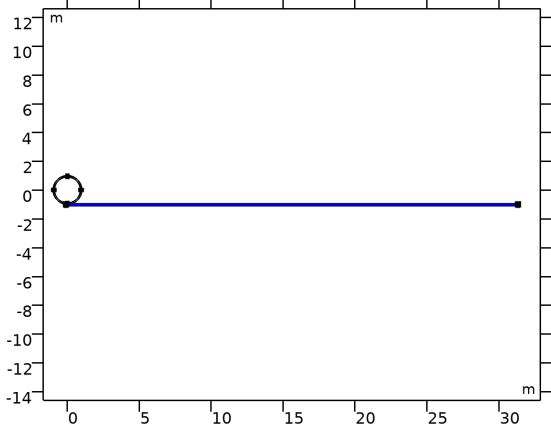
Boundary selection, destination

Selection	
Geometric entity level	Entire model

Equations

$$F_n = \mathrm{if}\left(gap \le 0, -p_n\, gap, 0\right) + \mathrm{if}\left(gap \le 0, -p_{nv}\, \min(g\dot{a}p, 0), 0\right)$$

$$p_n = 10^{10} f_p\, dia$$

$$p_{nv} = \tau_n p_n$$

$$gap = d - r_s$$

$$d = \left\| \left((\mathbf{X}_s + \mathbf{u}_{c,src}) - (\mathbf{X}_p + \mathbf{u}_p) \right) \cdot \mathbf{n}_d \right\|$$

$$\mathbf{u}_{c,src} = \mathbf{u}_{src} + (\mathbf{R}_{src} - \mathbf{I})(\mathbf{X}_s - \mathbf{X}_{src})$$

$$\mathbf{u}_p = \mathbf{u}_{dest} + (\mathbf{R}_{dest} - \mathbf{I})(\mathbf{X}_p - \mathbf{X}_{dest})$$

$$\mathbf{n}_d = \mathbf{n}_{d0} \cdot \mathbf{R}_{dest}$$

Source

Settings

Description	Value	Unit
Shape	Circular	
Source	Rigid Material 2	
Shape parameters	User defined	
Radius	Rc	m
Center	User defined	
Source center, x-component	0	m
Source center, y-component	0	m
Source center, z-component	0	m

Destination

Settings

Description	Value
Shape	Planar

Contact Settings

Settings

Description	Value	Unit
Formulation	Penalty, dynamic	
Penalty factor control	Automatic	
Penalty factor multiplier	0.001	1
Viscous penalty factor control	Automatic	
Characteristic time	5E-5	s
Compute viscous contact dissipation	On	

Variables

Name	Expression	Unit	Description	Selection	Details
mbd.rbc1.Xsx	0	m	Source center, x-component	Global	
mbd.rbc1.Xsy	0	m	Source center, y-component	Global	
mbd.rbc1.Xsz	0	m	Source center, z-component	Global	
mbd.rbc1.uc_src	mbd.rd2.rotxx*(mbd.rbc1.Xsx-mbd.rd2.xcx)+mbd.rd2.rotxy*(mbd.rbc1.Xsy-mbd.rd2.xcy)+mbd.rd2.rotxz*(mbd.rbc1.Xsz-mbd.rd2.xcz)-mbd.rbc1.Xsx+mbd.rd2.xcx+mbd.rd2.u	m	Source displacement at center, x-component	Global	
mbd.rbc1.vc_src	mbd.rd2.rotyx*(mbd.rbc1.Xsx-mbd.rd2.xcx)+mbd.rd2.rotyy*(mbd.rbc1.Xsy-mbd.rd2.xcy)+mbd.rd2.rotyz*(mbd.rbc1.Xsz-mbd.rd2.xcz)-mbd.rbc1.Xsy+mbd.rd2.xcy+mbd.rd2.v	m	Source displacement at center, y-component	Global	
mbd.rbc1.wc_src	mbd.rd2.rotzx*(mbd.rbc1.Xsx-mbd.rd2.xcx)+mbd.rd2.rotzy*(mbd.rbc1.Xsy-mbd.rd2.xcy)+mbd.rd2.rotzz*(mbd.rbc1.Xsz-mbd.rd2.xcz)-mbd.rbc1.Xsz+mbd.rd2.xcz	m	Source displacement at center, z-component	Global	
mbd.rbc1.Xdx	mbd.rd1.xcx	m	Destination center, x-component	Global	
mbd.rbc1.Xdy	mbd.rd1.xcy	m	Destination center, y-component	Global	
mbd.rbc1.Xdz	mbd.rd1.xcz	m	Destination center, z-component	Global	

mbd.rbc1.uc_dest	mbd.rd1.u	m	Destination displacement at center, x-component	Global
mbd.rbc1.vc_dest	mbd.rd1.v	m	Destination displacement at center, y-component	Global
mbd.rbc1.wc_dest	0	m	Destination displacement at center, z-component	Global
mbd.rbc1.rs	Rc	m	Source radius	Global
mbd.rbc1.xsx	mbd.rbc1.Xsx+mbd.rbc1.uc_src	m	Spatial position of source center, x-component	Global
mbd.rbc1.xsy	mbd.rbc1.Xsy+mbd.rbc1.vc_src	m	Spatial position of source center, y-component	Global
mbd.rbc1.xsz	mbd.rbc1.Xsz+mbd.rbc1.wc_src	m	Spatial position of source center, z-component	Global
mbd.rbc1.xpx	mbd.rbc1.Xpx+mbd.rbc1.up	m	Spatial position of destination plane point, x-component	Global
mbd.rbc1.xpy	mbd.rbc1.Xpy+mbd.rbc1.vp	m	Spatial position of destination plane point, y-component	Global
mbd.rbc1.xpz	mbd.rbc1.Xpz+mbd.rbc1.wp	m	Spatial position of destination plane point, z-component	Global
mbd.rbc1.xdx	mbd.rbc1.Xdx+mbd.rbc1.uc_dest	m	Spatial position of destination center, x-component	Global
mbd.rbc1.xdy	mbd.rbc1.Xdy+mbd.rbc1.vc_dest	m	Spatial position of destination center, y-component	Global
mbd.rbc1.xdz	mbd.rbc1.Xdz+mbd.rbc1.wc_dest	m	Spatial position of destination center, z-component	Global
mbd.rbc1.d	sqrt(((mbd.rbc1.xpx-mbd.rbc1.xsx)*mbd.rbc1.ndx+(mbd.rbc1.xpy-mbd.rbc1.xsy)*mbd.rbc1.ndy+ (mbd.rbc1.xpz-mbd.rbc1.xsz)*mbd.rbc1.ndz)^2+eps)	m	Distance between source center and contact point	Global
mbd.rbc1.dx	((mbd.rbc1.xpx-mbd.rbc1.xsx)*mbd.rbc1.ndx+(mbd.rbc1.xpy-mbd.rbc1.xsy)*mbd.rbc1.ndy+ (mbd.rbc1.xpz-mbd.rbc1.xsz)*mbd.rbc1.ndz)*mbd.rbc1.ndx	m	Instantaneous distance, x-component	Global
mbd.rbc1.dy	((mbd.rbc1.xpx-mbd.rbc1.xsx)*mbd.rbc1.ndx+(mbd.rbc1.xpy-mbd.rbc1.xsy)*mbd.rbc1.ndy+ (mbd.rbc1.xpz-mbd.rbc1.xsz)*mbd.rbc1.ndz)*mbd.rbc1.ndy	m	Instantaneous distance, y-component	Global
mbd.rbc1.dz	((mbd.rbc1.xpx-mbd.rbc1.xsx)*mbd.rbc1.ndx+(mbd.rbc1.xpy-mbd.rbc1.xsy)*mbd.rbc1.ndy+ (mbd.rbc1.xpz-mbd.rbc1.xsz)*mbd.rbc1.ndz)*mbd.rbc1.ndz	m	Instantaneous distance, z-component	Global
mbd.rbc1.ecx	nojac(mbd.rbc1.dx/mbd.rbc1.d)	1	Direction vector from source center to contact point, x-component	Global
mbd.rbc1.ecy	nojac(mbd.rbc1.dy/mbd.rbc1.d)	1	Direction vector from source center to contact point, y-component	Global
mbd.rbc1.ecz	nojac(mbd.rbc1.dz/mbd.rbc1.d)	1	Direction vector from source center to contact point, z-component	Global
mbd.rbc1.gap	mbd.rbc1.d-mbd.rbc1.rs	m	Gap distance	Global
mbd.rbc1.incontact	if(mbd.rbc1.gap<0,1,0)	1	In contact control variable	Global
mbd.rbc1.pn	0.001*1.0E10[N/m^2]*mbd.diag	N/m	Penalty factor	Global
mbd.rbc1.pnv	0.05[ms]*mbd.rbc1.pn	N·s/m	Viscous penalty factor	Global

mbd.rbc1.Fns	if(mbd.rbc1.gap<=0,-mbd.rbc1.pn*mbd.rbc1.gap,0)	N	Contact force, elastic part	Global	
mbd.rbc1.Fn	mbd.rbc1.Fns+mbd.rbc1.Fnv	N	Contact force	Global	+ operation
mbd.rbc1.Fnx	mbd.rbc1.Fn*mbd.rbc1.ecx	N	Contact force, x-component	Global	
mbd.rbc1.Fny	mbd.rbc1.Fn*mbd.rbc1.ecy	N	Contact force, y-component	Global	
mbd.rbc1.Fnz	mbd.rbc1.Fn*mbd.rbc1.ecz	N	Contact force, z-component	Global	
mbd.rbc1.Ws	-0.5*mbd.rbc1.Fns*mbd.rbc1.gap	J	Elastic energy stored	Global	
mbd.rbc1.Fnv	if(mbd.rbc1.gap<=0,-mbd.rbc1.pnv*min(d(mbd.rbc1.gap,TIME),0),0)	N	Contact force, viscous part	Global	
mbd.rbc1.Qv	-mbd.rbc1.Fnv*d(mbd.rbc1.gap,TIME)	W	Viscous energy dissipation rate	Global	
mbd.rbc1.Xpx	-0.1	m	Destination plane point coordinate, x-component	Global	
mbd.rbc1.Xpy	-0.9999999999999999	m	Destination plane point coordinate, y-component	Global	
mbd.rbc1.Xpz	0	m	Destination plane point coordinate, z-component	Global	
mbd.rbc1.up	mbd.rd1.rotxx*(mbd.rbc1.Xpx-mbd.rd1.xcx)+mbd.rd1.rotxy*(mbd.rbc1.Xpy-mbd.rd1.xcy)+mbd.rd1.rotxz*(mbd.rbc1.Xpz-mbd.rd1.xcz)-mbd.rbc1.Xpx+mbd.rd1.xcx+mbd.rd1.u	m	Destination plane point displacement, x-component	Global	
mbd.rbc1.vp	mbd.rd1.rotyx*(mbd.rbc1.Xpx-mbd.rd1.xcx)+mbd.rd1.rotyy*(mbd.rbc1.Xpy-mbd.rd1.xcy)+mbd.rd1.rotyz*(mbd.rbc1.Xpz-mbd.rd1.xcz)-mbd.rbc1.Xpy+mbd.rd1.xcy+mbd.rd1.v	m	Destination plane point displacement, y-component	Global	
mbd.rbc1.wp	mbd.rd1.rotzx*(mbd.rbc1.Xpx-mbd.rd1.xcx)+mbd.rd1.rotzy*(mbd.rbc1.Xpy-mbd.rd1.xcy)+mbd.rd1.rotzz*(mbd.rbc1.Xpz-mbd.rd1.xcz)-mbd.rbc1.Xpz+mbd.rd1.xcz+mbd.rd1.w	m	Destination plane point displacement, z-component	Global	
mbd.rbc1.nd0x	0	1	Initial normal to destination plane, x-component	Global	
mbd.rbc1.nd0y	1	1	Initial normal to destination plane, y-component	Global	
mbd.rbc1.nd0z	0	1	Initial normal to destination plane, z-component	Global	
mbd.rbc1.ndx	mbd.rd1.rotxx*mbd.rbc1.nd0x+mbd.rd1.rotxy*mbd.rbc1.nd0y+mbd.rd1.rotxz*mbd.rbc1.nd0z	1	Normal to destination plane, x-component	Global	
mbd.rbc1.ndy	mbd.rd1.rotyx*mbd.rbc1.nd0x+mbd.rd1.rotyy*mbd.rbc1.nd0y+mbd.rd1.rotyz*mbd.rbc1.nd0z	1	Normal to destination plane, y-component	Global	
mbd.rbc1.ndz	mbd.rd1.rotzx*mbd.rbc1.nd0x+mbd.rd1.rotzy*mbd.rbc1.nd0y+mbd.rd1.rotzz*mbd.rbc1.nd0z	1	Normal to destination plane, z-component	Global	

Shape functions

Name	Shape function	Unit	Description	Shape frame	Selection
mbd.rbc1.Wv	ODE	J	Viscous energy dissipation		Global

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
(d(mbd.rbc1.Wv,TIME)-nojac(mbd.rbc1.Qv))*test(mbd.rbc1.Wv)	2		Global
if(mbd.rbc1.gap<0,mbd.rbc1.Fn*test(mbd.rbc1.gap),0)	2		Global

Friction 1

Selection	
Geometric entity level	Entire model

Equations

$$\mathbf{F}_f = \min(\mu F_n + F_{f,r}, F_{f,max}) \frac{\mathbf{v}_{slip}}{|\mathbf{v}_{slip}|}\left(1 - \exp\left(-\frac{|\mathbf{v}_{slip}|}{v_0}\right)\right)$$

$$\mathbf{v}_{slip} = (\mathbf{v}_{cs} - \mathbf{v}_{cd}) - ((\mathbf{v}_{cs} - \mathbf{v}_{cd}) \cdot \mathbf{e}_c)\mathbf{e}_c$$

$$\mathbf{v}_{cs} = \mathbf{v}_{src} + \boldsymbol{\omega}_{src} \times \mathbf{r}_s \quad \mathbf{v}_{cd} = \mathbf{v}_{dest} + \boldsymbol{\omega}_{dest} \times \mathbf{r}_d$$

$$\mathbf{r}_s = r_s\mathbf{e}_c \quad \mathbf{r}_d = (\mathbf{X}_{src} + \mathbf{u}_{src}) - (\mathbf{X}_{dest} + \mathbf{u}_{dest}) + d\mathbf{e}_c$$

$$\mathbf{e}_c = (((\mathbf{X}_P + \mathbf{u}_P) - (\mathbf{X}_S + \mathbf{u}_{c,src})) \cdot \mathbf{n}_d)\mathbf{n}_d/d$$

Friction

Settings

Description	Value	Unit
Friction coefficient	mu	1
Characteristic slip velocity	1E-4	m/s

Advanced

Settings

Description	Value	Unit
Additional sliding resistance	0	N
Maximum friction force	Inf	N
Compute frictional dissipation	On	

Variables

Name	Expression	Unit	Description	Selection
mbd.rbc1.vslipx	mbd.rbc1.vcsx-mbd.rbc1.vcdx-((mbd.rbc1.vcsx-mbd.rbc1.vcdx)*mbd.rbc1.ecx+(mbd.rbc1.vcsy-mbd.rbc1.vcdy)*mbd.rbc1.ecy+(mbd.rbc1.vcsz-mbd.rbc1.vcdz)*mbd.rbc1.ecz)*mbd.rbc1.ecx	m/s	Slip velocity, x-component	Global
mbd.rbc1.vslipy	mbd.rbc1.vcsy-mbd.rbc1.vcdy-((mbd.rbc1.vcsx-mbd.rbc1.vcdx)*mbd.rbc1.ecx+(mbd.rbc1.vcsy-mbd.rbc1.vcdy)*mbd.rbc1.ecy+(mbd.rbc1.vcsz-mbd.rbc1.vcdz)*mbd.rbc1.ecz)*mbd.rbc1.ecy	m/s	Slip velocity, y-component	Global
mbd.rbc1.vslipz	mbd.rbc1.vcsz-mbd.rbc1.vcdz-((mbd.rbc1.vcsx-mbd.rbc1.vcdx)*mbd.rbc1.ecx+(mbd.rbc1.vcsy-mbd.rbc1.vcdy)*mbd.rbc1.ecy+(mbd.rbc1.vcsz-mbd.rbc1.vcdz)*mbd.rbc1.ecz)*mbd.rbc1.ecz	m/s	Slip velocity, z-component	Global
mbd.rbc1.vslip	nojac(sqrt(mbd.rbc1.vslipx^2+mbd.rbc1.vslipy^2+mbd.rbc1.vslipz^2+eps))	m/s	Slip velocity magnitude	Global
mbd.rbc1.Ffx	mbd.rbc1.Ff*mbd.rbc1.eslipx	N	Friction force, x-component	Global
mbd.rbc1.Ffy	mbd.rbc1.Ff*mbd.rbc1.eslipy	N	Friction force, y-component	Global
mbd.rbc1.Ffz	mbd.rbc1.Ff*mbd.rbc1.eslipz	N	Friction force, z-component	Global
mbd.rbc1.Ff	min(mbd.rbc1.fric1.mu*mbd.rbc1.Fn+mbd.rbc1.fric1.Ffr,mbd.rbc1.fric1.Ffmax)*(1-exp(-mbd.rbc1.vslip/mbd.rbc1.fric1.v0))	N	Friction force	Global
mbd.rbc1.fric1.mu	mu	1	Friction coefficient	Global
mbd.rbc1.fric1.v0	1.0E-4	m/s	Characteristic slip velocity	Global
mbd.rbc1.fric1.Ffr	0	N	Additional sliding resistance	Global
mbd.rbc1.fric1.Ffmax	Inf	N	Maximum friction force	Global
mbd.rbc1.rsx	mbd.rbc1.rs*mbd.rbc1.ecx	m	Position vector of contact point from source center, x-component	Global
mbd.rbc1.rsy	mbd.rbc1.rs*mbd.rbc1.ecy	m	Position vector of contact point from source center, y-component	Global
mbd.rbc1.rsz	mbd.rbc1.rs*mbd.rbc1.ecz	m	Position vector of contact point from source center, z-component	Global
mbd.rbc1.vcsx	mbd.rd2.u_tx+mbd.rbc1.rsz*mbd.rd2.th_ty-mbd.rbc1.rsy*mbd.rd2.th_tz	m/s	Velocity of source at contact point, x-component	Global
mbd.rbc1.vcsy	mbd.rd2.u_ty-mbd.rbc1.rsz*mbd.rd2.th_tx+mbd.rbc1.rsx*mbd.rd2.th_tz	m/s	Velocity of source at contact point, y-component	Global
mbd.rbc1.vcsz	mbd.rd2.u_tz+mbd.rbc1.rsy*mbd.rd2.th_tx-mbd.rbc1.rsx*mbd.rd2.th_ty	m/s	Velocity of source at contact point, z-component	Global

mbd.rbc1.rdx	mbd.rbc1.xsx+mbd.rbc1.dx-mbd.rbc1.xdx	m	Position vector of contact point from destination center, x-component	Global
mbd.rbc1.rdy	mbd.rbc1.xsy+mbd.rbc1.dy-mbd.rbc1.xdy	m	Position vector of contact point from destination center, y-component	Global
mbd.rbc1.rdz	mbd.rbc1.xsz+mbd.rbc1.dz-mbd.rbc1.xdz	m	Position vector of contact point from destination center, z-component	Global
mbd.rbc1.vcdx	mbd.rd1.u_tx+mbd.rbc1.rdz*mbd.rd1.th_ty-mbd.rbc1.rdy*mbd.rd1.th_tz	m/s	Velocity of destination at contact point, x-component	Global
mbd.rbc1.vcdy	mbd.rd1.u_ty-mbd.rbc1.rdz*mbd.rd1.th_tx+mbd.rbc1.rdx*mbd.rd1.th_tz	m/s	Velocity of destination at contact point, y-component	Global
mbd.rbc1.vcdz	mbd.rd1.u_tz+mbd.rbc1.rdy*mbd.rd1.th_tx-mbd.rbc1.rdx*mbd.rd1.th_ty	m/s	Velocity of destination at contact point, z-component	Global
mbd.rbc1.eslipx	mbd.rbc1.vslipx/mbd.rbc1.vslip	1	Slip velocity direction, x-component	Global
mbd.rbc1.eslipy	mbd.rbc1.vslipy/mbd.rbc1.vslip	1	Slip velocity direction, y-component	Global
mbd.rbc1.eslipz	mbd.rbc1.vslipz/mbd.rbc1.vslip	1	Slip velocity direction, z-component	Global
mbd.rbc1.Mfsx	-mbd.rbc1.Ffz*mbd.rbc1.rsy+mbd.rbc1.Ffy*mbd.rbc1.rsz	N·m	Friction moment at source center, x-component	Global
mbd.rbc1.Mfsy	mbd.rbc1.Ffz*mbd.rbc1.rsx-mbd.rbc1.Ffx*mbd.rbc1.rsz	N·m	Friction moment at source center, y-component	Global
mbd.rbc1.Mfsz	-mbd.rbc1.Ffy*mbd.rbc1.rsx+mbd.rbc1.Ffx*mbd.rbc1.rsy	N·m	Friction moment at source center, z-component	Global
mbd.rbc1.Mfdx	mbd.rbc1.Ffz*mbd.rbc1.rdy-mbd.rbc1.Ffy*mbd.rbc1.rdz	N·m	Friction moment at destination center, x-component	Global
mbd.rbc1.Mfdy	-mbd.rbc1.Ffz*mbd.rbc1.rdx+mbd.rbc1.Ffx*mbd.rbc1.rdz	N·m	Friction moment at destination center, y-component	Global
mbd.rbc1.Mfdz	mbd.rbc1.Ffy*mbd.rbc1.rdx-mbd.rbc1.Ffx*mbd.rbc1.rdy	N·m	Friction moment at destination center, z-component	Global
mbd.rbc1.Qf	mbd.rbc1.Ffx*mbd.rbc1.vslipx+mbd.rbc1.Ffy*mbd.rbc1.vslipy+mbd.rbc1.Ffz*mbd.rbc1.vslipz	W	Frictional energy dissipation rate	Global

Shape functions

Name	Shape function	Unit	Description	Shape frame	Selection
mbd.rbc1.Wf	ODE	J	Frictional energy dissipation		Global

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
if(mbd.rbc1.gap<0,-mbd.rbc1.Ffx*test(mbd.rd2.u)-mbd.rbc1.Ffy*test(mbd.rd2.v),0)	2		Global
if(mbd.rbc1.gap<0,mbd.rbc1.Mfsz*test(mbd.rd2.phi),0)	2		Global
if(mbd.rbc1.gap<0,mbd.rbc1.Ffx*test(mbd.rd1.u)+mbd.rbc1.Ffy*test(mbd.rd1.v),0)	2		Global
if(mbd.rbc1.gap<0,mbd.rbc1.Mfdz*test(mbd.rd1.phi),0)	2		Global
(d(mbd.rbc1.Wf,TIME)-nojac(mbd.rbc1.Qf))*test(mbd.rbc1.Wf)	2		Global

2.4.7. Rigid Material 1
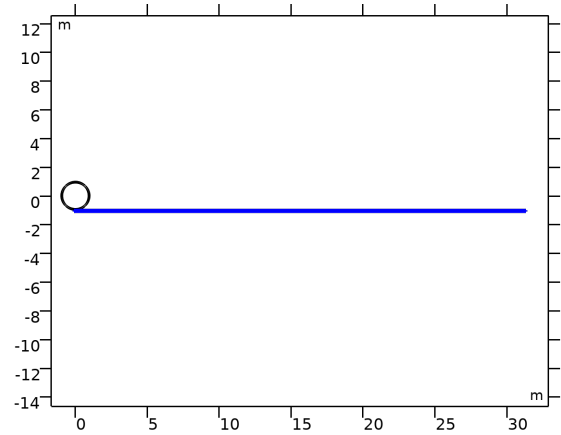
Rigid Material 1

Selection

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domain 5

Equations

$$m \cdot \frac{d^2}{dt^2}\mathbf{u} + \sum \mathbf{F}_\mathrm{I} = \sum \mathbf{F}_\mathrm{ext}$$

$$I_z \cdot \frac{d^2\phi}{dt^2} + \sum M_\mathrm{I} = \sum M_\mathrm{ext}$$

$$m = \int \rho \, d\, dA$$

$$I_z = \int ((\mathbf{X} - \mathbf{X}_\mathrm{M}) \cdot (\mathbf{X} - \mathbf{X}_\mathrm{M})) \rho \, d\, dA, \qquad \mathbf{X}_\mathrm{M} = \frac{\int \rho \mathbf{X} \, d\, dA}{m}$$

$$\mathbf{R} \;\rightarrow\; \mathbf{R}\left(\sin\phi, \cos\phi\right)$$

- -

$$\mathbf{u}_0 = -\mathbf{r}\,(1 - \cos\phi) + (\mathbf{e}_z \times \mathbf{r})\sin\phi + \mathbf{u}$$

$$\left(\frac{\partial \mathbf{u}}{\partial t}\right)_0 = \left(\mathbf{e}_z \times (\mathbf{r} + \mathbf{u}_0 - \mathbf{u})\right)\frac{\partial \phi}{\partial t} + \frac{\partial \mathbf{u}}{\partial t} \qquad \mathbf{r} = (\mathbf{X}_\mathrm{M} - \mathbf{X}_c)$$

$$\phi_0 = \phi$$

$$\left(\frac{\partial \phi}{\partial t}\right)_0 = \frac{\partial \phi}{\partial t}$$

Density

Settings

Description	Value
Density	From material

Center of Rotation

Settings

Description	Value
Center of rotation	Center of mass
Offset	Off

Initial Values

Settings

Description	Value
Initial values	From physics interface node
Consistent initialization	Default

Properties from material

Property	Material	Property group
Density	Material 1	Basic

Variables

Name	Expression	Unit	Description	Selection	Details
u	mbd.rd1.Udx	m	Displacement field, X-component	Domain 5	
v	mbd.rd1.Udy	m	Displacement field, Y-component	Domain 5	
w	mbd.rd1.Udz	m	Displacement field, Z-component	Domain 5	
mbd.Wk_tot	0.5*(mbd.rd1.m*(mbd.rd1.u_tx^2+mbd.rd1.u_ty^2+mbd.rd1.u_tz^2)+mbd.rd1.Iz*(mbd.rd1.th_tx^2+mbd.rd1.th_ty^2+mbd.rd1.th_tz^2))	J	Total kinetic energy	Global	+ operation
mbd.RFtotalx	reacf(mbd.rd1.u)	N	Total reaction force, x-component	Global	+ operation
mbd.RFtotaly	reacf(mbd.rd1.v)	N	Total reaction force, y-component	Global	+ operation
mbd.RFtotalz	0	N	Total reaction force, z-component	Global	+ operation
mbd.RMtotalx	-reacf(mbd.rd1.v)*mbd.rd1.RMmaz	N·m	Total reaction moment, x-component	Global	+ operation
mbd.RMtotaly	reacf(mbd.rd1.u)*mbd.rd1.RMmaz	N·m	Total reaction moment, y-component	Global	+ operation
mbd.RMtotalz	reacf(mbd.rd1.v)*mbd.rd1.RMmax-reacf(mbd.rd1.u)*mbd.rd1.RMmay+reacf(mbd.rd1.phi)	N·m	Total reaction moment, z-component	Global	+ operation
mbd.disp	sqrteps(real(u)^2+real(v)^2)	m	Displacement magnitude	Domain 5	
mbd.gradUxX	-1+mbd.FdxX	1	Displacement gradient, xX-component	Domain 5	
mbd.gradUyX	mbd.FdyX	1	Displacement gradient, yX-component	Domain 5	
mbd.gradUzX	mbd.FdzX	1	Displacement gradient, zX-component	Domain 5	
mbd.gradUxY	mbd.FdxY	1	Displacement gradient, xY-component	Domain 5	
mbd.gradUyY	-1+mbd.FdyY	1	Displacement gradient, yY-component	Domain 5	
mbd.gradUzY	mbd.FdzY	1	Displacement gradient, zY-component	Domain 5	
mbd.gradUxZ	mbd.FdxZ	1	Displacement gradient, xZ-component	Domain 5	
mbd.gradUyZ	mbd.FdyZ	1	Displacement gradient, yZ-component	Domain 5	
mbd.gradUzZ	-1+mbd.FdzZ	1	Displacement gradient, zZ-component	Domain 5	
mbd.FdxX	mbd.rd1.rotxx	1	Deformation gradient, xX-component	Domain 5	
mbd.FdyX	mbd.rd1.rotyx	1	Deformation gradient, yX-component	Domain 5	
mbd.FdzX	mbd.rd1.rotzx	1	Deformation gradient, zX-component	Domain 5	
mbd.FdxY	mbd.rd1.rotxy	1	Deformation gradient, xY-component	Domain 5	
mbd.FdyY	mbd.rd1.rotyy	1	Deformation gradient, yY-component	Domain 5	
mbd.FdzY	mbd.rd1.rotzy	1	Deformation gradient, zY-component	Domain 5	
mbd.FdxZ	mbd.rd1.rotxz	1	Deformation gradient, xZ-component	Domain 5	
mbd.FdyZ	mbd.rd1.rotyz	1	Deformation gradient, yZ-component	Domain 5	
mbd.FdzZ	mbd.rd1.rotzz	1	Deformation gradient, zZ-component	Domain 5	
mbd.FdiXx	(mbd.FdyY*mbd.FdzZ-mbd.FdyZ*mbd.FdzY)/mbd.J	1	Deformation gradient inverse, Xx-component	Domain 5	
mbd.FdiYx	(mbd.FdyZ*mbd.FdzX-mbd.FdyX*mbd.FdzZ)/mbd.J	1	Deformation gradient inverse, Yx-component	Domain 5	
mbd.FdiZx	(mbd.FdyX*mbd.FdzY-mbd.FdyY*mbd.FdzX)/mbd.J	1	Deformation gradient inverse, Zx-component	Domain 5	
mbd.FdiXy	(mbd.FdxZ*mbd.FdzY-mbd.FdxY*mbd.FdzZ)/mbd.J	1	Deformation gradient inverse, Xy-component	Domain 5	
mbd.FdiYy	(mbd.FdxX*mbd.FdzZ-mbd.FdxZ*mbd.FdzX)/mbd.J	1	Deformation gradient inverse, Yy-component	Domain 5	
mbd.FdiZy	(mbd.FdxY*mbd.FdzX-mbd.FdxX*mbd.FdzY)/mbd.J	1			

			Deformation gradient inverse, Zy-component	Domain 5	
mbd.FdiXz	(mbd.FdxY*mbd.FdyZ-mbd.FdxZ*mbd.FdyY)/mbd.J	1	Deformation gradient inverse, Xz-component	Domain 5	
mbd.FdiYz	(mbd.FdxZ*mbd.FdyX-mbd.FdxX*mbd.FdyZ)/mbd.J	1	Deformation gradient inverse, Yz-component	Domain 5	
mbd.FdiZz	(mbd.FdxX*mbd.FdyY-mbd.FdxY*mbd.FdyX)/mbd.J	1	Deformation gradient inverse, Zz-component	Domain 5	
mbd.J	1	1	Volume ratio	Domain 5	
mbd.Ws	0	J/m³	Elastic strain energy density	Domain 5	+ operation
mbd.Ws_tot	0	J	Total elastic strain energy	Global	+ operation
mbd.Wk	0.5*mbd.rho*(mbd.u_tX^2+mbd.u_tY^2+mbd.u_tZ^2)	J/m³	Kinetic energy density	Domain 5	+ operation
mbd.Eequ	Inf	Pa	Equivalent Young's modulus	Domain 5	
mbd.nuequ	0	1	Equivalent Poisson's ratio	Domain 5	
mbd.Eequtot	mbd.Eequ	Pa	Total equivalent Young's modulus	Domain 5	+ operation
mbd.rho	material.rho	kg/m³	Density	Domain 5	Meta, * operation
mbd.u_ttX	d(d(mbd.rd1.Udx,TIME),TIME)	m/s²	Acceleration, X-component	Domain 5	
mbd.u_ttY	d(d(mbd.rd1.Udy,TIME),TIME)	m/s²	Acceleration, Y-component	Domain 5	
mbd.u_ttZ	d(d(mbd.rd1.Udz,TIME),TIME)	m/s²	Acceleration, Z-component	Domain 5	
mbd.u_tX	d(mbd.rd1.Udx,TIME)	m/s	Velocity, X-component	Domain 5	
mbd.u_tY	d(mbd.rd1.Udy,TIME)	m/s	Velocity, Y-component	Domain 5	
mbd.u_tZ	d(mbd.rd1.Udz,TIME)	m/s	Velocity, Z-component	Domain 5	
mbd.afX	0	m/s²	Frame acceleration, X-component	Domain 5	+ operation
mbd.afY	0	m/s²	Frame acceleration, Y-component	Domain 5	+ operation
mbd.afZ	0	m/s²	Frame acceleration, Z-component	Domain 5	+ operation
mbd.accX	mbd.u_ttX	m/s²	Effective acceleration, X-component	Domain 5	+ operation
mbd.accY	mbd.u_ttY	m/s²	Effective acceleration, Y-component	Domain 5	+ operation
mbd.accZ	mbd.u_ttZ	m/s²	Effective acceleration, Z-component	Domain 5	+ operation
mbd.vel	sqrteps(real(mbd.u_tX)^2+real(mbd.u_tY)^2+real(mbd.u_tZ)^2)	m/s	Velocity magnitude	Domain 5	
mbd.acc	sqrteps(real(mbd.accX)^2+real(mbd.accY)^2+real(mbd.accZ)^2)	m/s²	Effective acceleration magnitude	Domain 5	
mbd.u_tt	sqrteps(real(mbd.u_ttX)^2+real(mbd.u_ttY)^2+real(mbd.u_ttZ)^2)	m/s²	Acceleration magnitude	Domain 5	
mbd.rd1.xcx	mbd.rd1.xmx	m	Center of rotation, x-component	Global	
mbd.rd1.xcy	mbd.rd1.xmy	m	Center of rotation, y-component	Global	
mbd.rd1.xcz	mbd.rd1.xmz	m	Center of rotation, z-component	Global	
mbd.rd1.rotxx	cos(mbd.rd1.phi)	1	Rotation matrix, xx-component	Global	
mbd.rd1.rotyx	sin(mbd.rd1.phi)	1	Rotation matrix, yx-component	Global	
mbd.rd1.rotzx	0	1	Rotation matrix, zx-component	Global	
mbd.rd1.rotxy	-sin(mbd.rd1.phi)	1	Rotation matrix, xy-component	Global	
mbd.rd1.rotyy	cos(mbd.rd1.phi)	1	Rotation matrix, yy-component	Global	
mbd.rd1.rotzy	0	1	Rotation matrix, zy-component	Global	
mbd.rd1.rotxz	0	1		Global	

			Rotation matrix, xz-component		
mbd.rd1.rotyz	0	1	Rotation matrix, yz-component	Global	
mbd.rd1.rotzz	1	1	Rotation matrix, zz-component	Global	
mbd.rd1.u_tx	d(mbd.rd1.u,TIME)	m/s	Rigid body velocity, x-component	Global	
mbd.rd1.u_ty	d(mbd.rd1.v,TIME)	m/s	Rigid body velocity, y-component	Global	
mbd.rd1.u_tz	0	m/s	Rigid body velocity, z-component	Global	
mbd.rd1.th_tx	d(mbd.rd1.thx,TIME)	rad/s	Rigid body angular velocity, x-component	Global	
mbd.rd1.th_ty	d(mbd.rd1.thy,TIME)	rad/s	Rigid body angular velocity, y-component	Global	
mbd.rd1.th_tz	d(mbd.rd1.thz,TIME)	rad/s	Rigid body angular velocity, z-component	Global	
mbd.phase	if(isdefined(phase),phase,0)	1	Phase	Global	
mbd.rd1.RMmax	mbd.rd1.xcx+mbd.rd1.u-mbd.refpntx	m	Moment arm, x-component	Global	
mbd.rd1.RMmay	mbd.rd1.xcy+mbd.rd1.v-mbd.refpnty	m	Moment arm, y-component	Global	
mbd.rd1.RMmaz	0	m	Moment arm, z-component	Global	
mbd.rd1.xmx	mbd.rd1.int((mbd.rho+eps)*mbd.d*X)/mbd.rd1.int((mbd.rho+eps)*mbd.d)	m	Center of mass, x-component	Global	
mbd.rd1.xmy	mbd.rd1.int((mbd.rho+eps)*mbd.d*Y)/mbd.rd1.int((mbd.rho+eps)*mbd.d)	m	Center of mass, y-component	Global	
mbd.rd1.xmz	0	m	Center of mass, z-component	Global	
mbd.rd1.Iz	mbd.rd1.int(((X-mbd.rd1.xmx)^2+(Y-mbd.rd1.xmy)^2+mbd.rd1.xmz^2)*mbd.rho*mbd.d)	kg·m²	Moment of inertia	Global	
mbd.rd1.um	mbd.rd1.u	m	Rigid body displacement, x-component	Global	
mbd.rd1.vm	mbd.rd1.v	m	Rigid body displacement, y-component	Global	
mbd.rd1.wm	0	m	Rigid body displacement, z-component	Global	
mbd.rd1.m	mbd.rd1.int(mbd.rho*mbd.d)	kg	Mass	Global	
mbd.rd1.Udx	mbd.rd1.rotxx*(X-mbd.rd1.xcx)+mbd.rd1.rotxy*(Y-mbd.rd1.xcy)-mbd.rd1.rotxz*mbd.rd1.xcz-X+mbd.rd1.xcx+mbd.rd1.u	m	Domain displacement, x-component	Domain 5	+ operation
mbd.rd1.Udy	mbd.rd1.rotyx*(X-mbd.rd1.xcx)+mbd.rd1.rotyy*(Y-mbd.rd1.xcy)-mbd.rd1.rotyz*mbd.rd1.xcz-Y+mbd.rd1.xcy+mbd.rd1.v	m	Domain displacement, y-component	Domain 5	+ operation
mbd.rd1.Udz	mbd.rd1.rotzx*(X-mbd.rd1.xcx)+mbd.rd1.rotzy*(Y-mbd.rd1.xcy)-mbd.rd1.rotzz*mbd.rd1.xcz+mbd.rd1.xcz	m	Domain displacement, z-component	Domain 5	+ operation
mbd.rd1.thx	0	rad	Rigid body rotation, x-component	Global	
mbd.rd1.thy	0	rad	Rigid body rotation, y-component	Global	
mbd.rd1.thz	mbd.rd1.phi	rad	Rigid body rotation, z-component	Global	
mbd.rd1.u_ttx	d(mbd.rd1.u_tx,TIME)	m/s²	Rigid body acceleration, x-component	Global	
mbd.rd1.u_tty	d(mbd.rd1.u_ty,TIME)	m/s²	Rigid body acceleration, y-component	Global	
mbd.rd1.u_ttz	d(mbd.rd1.u_tz,TIME)	m/s²	Rigid body acceleration, z-component	Global	
mbd.rd1.um_ttx	d(d(mbd.rd1.um,TIME),TIME)	m/s²	Rigid body acceleration, x-component	Global	
mbd.rd1.um_tty	d(d(mbd.rd1.vm,TIME),TIME)	m/s²	Rigid body acceleration, y-component	Global	
mbd.rd1.um_ttz	d(d(mbd.rd1.wm,TIME),TIME)	m/s²	Rigid body acceleration, z-component	Global	
mbd.rd1.th_ttx	d(mbd.rd1.th_tx,TIME)	rad/s²	Rigid body angular acceleration, x-component	Global	
mbd.rd1.th_tty	d(mbd.rd1.th_ty,TIME)	rad/s²	Rigid body angular acceleration, y-component	Global	
mbd.rd1.th_ttz	d(mbd.rd1.th_tz,TIME)	rad/s²	Rigid body angular acceleration, z-component	Global	
mbd.rd1.FIx	-mbd.rd1.m*mbd.rd1.um_ttx	N	Inertial force, x-component	Global	
mbd.rd1.FIy	-mbd.rd1.m*mbd.rd1.um_tty	N	Inertial force, y-component	Global	
mbd.rd1.FIz	0	N	Inertial force, z-component	Global	
mbd.rd1.MIz	-mbd.rd1.Iz*d(d(mbd.rd1.phi,TIME),TIME)	N·m	Inertial moment	Global	
mbd.rd1.i_rot	1	1	Free rotation indicator	Global	* operation

Shape functions

Name	Shape function	Unit	Description	Shape frame	Selection
mbd.rd1.phi	ODE	rad	Rigid body rotation		Global
mbd.rd1.u	ODE	m	Rigid body displacement, x-component		Global
mbd.rd1.v	ODE	m	Rigid body displacement, y-component		Global

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
mbd.rd1.FIx*test(mbd.rd1.um)+mbd.rd1.FIy*test(mbd.rd1.vm)+mbd.rd1.FIz*test(mbd.rd1.wm)	2		Global
mbd.rd1.MIz*test(mbd.rd1.phi)	2		Global

Constraints

Constraint	Constraint force	Shape function	Selection	Details
up(u)-down(u)	test(up(u)-down(u))	Lagrange (Linear)	No boundaries	Elemental
up(v)-down(v)	test(up(v)-down(v))	Lagrange (Linear)	No boundaries	Elemental
0	0		No boundaries	Elemental

Fixed Constraint 1

Selection	
Geometric entity level	Entire model

Equations

$$\mathbf{u} = \mathbf{0}$$

$$\phi = 0$$

Reaction Force Settings

Settings	
Description	**Value**
Evaluate reaction forces	Off

Constraints

Constraint	Constraint force	Shape function	Selection	Details
-mbd.rd1.u	test(-mbd.rd1.u)		Global	Elemental
-mbd.rd1.v	test(-mbd.rd1.v)		Global	Elemental
-mbd.rd1.phi	test(-mbd.rd1.phi)		Global	Elemental

2.4.8. Rigid Material 2
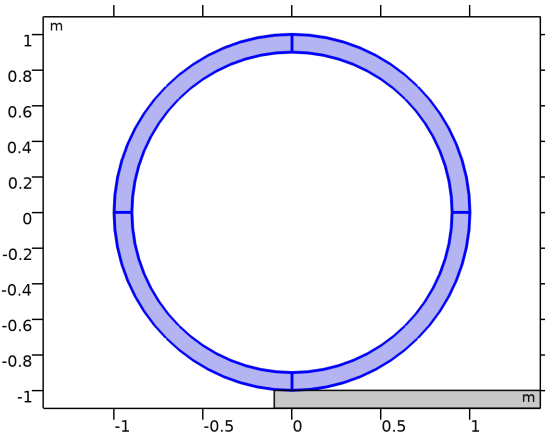
Rigid Material 2

Selection	
Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–4

Equations

$$m \frac{d^2}{dt^2}\mathbf{u} + \sum \mathbf{F}_l = \sum \mathbf{F}_{ext}$$

$$I_z \frac{d^2\phi}{dt^2} + \sum M_l = \sum M_{ext}$$

$$m = \int \rho \, d \, dA$$

$$I_z = \int ((\mathbf{X} - \mathbf{X}_M) \cdot (\mathbf{X} - \mathbf{X}_M)) \rho \, d \, dA, \qquad \mathbf{X}_M = \frac{\int \rho \mathbf{X} \, d \, dA}{m}$$

$$\mathbf{R} \; \rightarrow \; \mathbf{R}(\sin\phi, \cos\phi)$$

- -

$$\mathbf{u}_0 = -\mathbf{r} \, (1 - \cos\phi) + (\mathbf{e}_z \times \mathbf{r}) \sin\phi + \mathbf{u}$$

$$\left(\frac{\partial \mathbf{u}}{\partial t}\right)_0 = (\mathbf{e}_z \times (\mathbf{r} + \mathbf{u}_0 - \mathbf{u})) \frac{\partial \phi}{\partial t} + \frac{\partial \mathbf{u}}{\partial t} \qquad \mathbf{r} = (\mathbf{X}_M - \mathbf{X}_c)$$

$$\phi_0 = \phi$$

$$\left(\frac{\partial \phi}{\partial t}\right)_0 = \frac{\partial \phi}{\partial t}$$

Density

Settings

Description	Value
Density	From material

Center of Rotation

Settings

Description	Value
Center of rotation	Center of mass
Offset	Off

Initial Values

Settings

Description	Value
Initial values	From physics interface node
Consistent initialization	Default

Properties from material

Property	Material	Property group
Density	Material 1	Basic

Variables

Name	Expression	Unit	Description	Selection	Details
u	mbd.rd2.Udx	m	Displacement field, X-component	Domains 1–4	
v	mbd.rd2.Udy	m	Displacement field, Y-component	Domains 1–4	
w	mbd.rd2.Udz	m	Displacement field, Z-component	Domains 1–4	
mbd.Wk_tot	0.5*(mbd.rd2.m*(mbd.rd2.u_tx^2+mbd.rd2.u_ty^2+mbd.rd2.u_tz^2)+mbd.rd2.Iz*(mbd.rd2.th_tx^2+mbd.rd2.th_ty^2+mbd.rd2.th_tz^2))	J	Total kinetic energy	Global	+ operation
mbd.RFtotalx	reacf(mbd.rd2.u)	N	Total reaction force, x-component	Global	+ operation
mbd.RFtotaly	reacf(mbd.rd2.v)	N	Total reaction force, y-component	Global	+ operation
mbd.RFtotalz	0	N	Total reaction force, z-component	Global	+ operation
mbd.RMtotalx	-reacf(mbd.rd2.v)*mbd.rd2.RMmaz	N·m	Total reaction moment, x-component	Global	+ operation
mbd.RMtotaly	reacf(mbd.rd2.u)*mbd.rd2.RMmaz	N·m	Total reaction moment, y-component	Global	+ operation
mbd.RMtotalz	reacf(mbd.rd2.v)*mbd.rd2.RMmax-reacf(mbd.rd2.u)*mbd.rd2.RMmay+reacf(mbd.rd2.phi)	N·m	Total reaction moment, z-component	Global	+ operation
mbd.disp	sqrteps(real(u)^2+real(v)^2)	m	Displacement magnitude	Domains 1–4	

mbd.gradUxX	-1+mbd.FdxX	1	Displacement gradient, xX-component	Domains 1–4	
mbd.gradUyX	mbd.FdyX	1	Displacement gradient, yX-component	Domains 1–4	
mbd.gradUzX	mbd.FdzX	1	Displacement gradient, zX-component	Domains 1–4	
mbd.gradUxY	mbd.FdxY	1	Displacement gradient, xY-component	Domains 1–4	
mbd.gradUyY	-1+mbd.FdyY	1	Displacement gradient, yY-component	Domains 1–4	
mbd.gradUzY	mbd.FdzY	1	Displacement gradient, zY-component	Domains 1–4	
mbd.gradUxZ	mbd.FdxZ	1	Displacement gradient, xZ-component	Domains 1–4	
mbd.gradUyZ	mbd.FdyZ	1	Displacement gradient, yZ-component	Domains 1–4	
mbd.gradUzZ	-1+mbd.FdzZ	1	Displacement gradient, zZ-component	Domains 1–4	
mbd.FdxX	mbd.rd2.rotxx	1	Deformation gradient, xX-component	Domains 1–4	
mbd.FdyX	mbd.rd2.rotyx	1	Deformation gradient, yX-component	Domains 1–4	
mbd.FdzX	mbd.rd2.rotzx	1	Deformation gradient, zX-component	Domains 1–4	
mbd.FdxY	mbd.rd2.rotxy	1	Deformation gradient, xY-component	Domains 1–4	
mbd.FdyY	mbd.rd2.rotyy	1	Deformation gradient, yY-component	Domains 1–4	
mbd.FdzY	mbd.rd2.rotzy	1	Deformation gradient, zY-component	Domains 1–4	
mbd.FdxZ	mbd.rd2.rotxz	1	Deformation gradient, xZ-component	Domains 1–4	
mbd.FdyZ	mbd.rd2.rotyz	1	Deformation gradient, yZ-component	Domains 1–4	
mbd.FdzZ	mbd.rd2.rotzz	1	Deformation gradient, zZ-component	Domains 1–4	
mbd.FdiXx	(mbd.FdyY*mbd.FdzZ-mbd.FdyZ*mbd.FdzY)/mbd.J	1	Deformation gradient inverse, Xx-component	Domains 1–4	
mbd.FdiYx	(mbd.FdyZ*mbd.FdzX-mbd.FdyX*mbd.FdzZ)/mbd.J	1	Deformation gradient inverse, Yx-component	Domains 1–4	
mbd.FdiZx	(mbd.FdyX*mbd.FdzY-mbd.FdyY*mbd.FdzX)/mbd.J	1	Deformation gradient inverse, Zx-component	Domains 1–4	
mbd.FdiXy	(mbd.FdxZ*mbd.FdzY-mbd.FdxY*mbd.FdzZ)/mbd.J	1	Deformation gradient inverse, Xy-component	Domains 1–4	
mbd.FdiYy	(mbd.FdxX*mbd.FdzZ-mbd.FdxZ*mbd.FdzX)/mbd.J	1	Deformation gradient inverse, Yy-component	Domains 1–4	
mbd.FdiZy	(mbd.FdxY*mbd.FdzX-mbd.FdxX*mbd.FdzY)/mbd.J	1	Deformation gradient inverse, Zy-component	Domains 1–4	
mbd.FdiXz	(mbd.FdxY*mbd.FdyZ-mbd.FdxZ*mbd.FdyY)/mbd.J	1	Deformation gradient inverse, Xz-component	Domains 1–4	
mbd.FdiYz	(mbd.FdxZ*mbd.FdyX-mbd.FdxX*mbd.FdyZ)/mbd.J	1	Deformation gradient inverse, Yz-component	Domains 1–4	
mbd.FdiZz	(mbd.FdxX*mbd.FdyY-mbd.FdxY*mbd.FdyX)/mbd.J	1	Deformation gradient inverse, Zz-component	Domains 1–4	
mbd.J	1	1	Volume ratio	Domains 1–4	
mbd.Ws	0	J/m³	Elastic strain energy density	Domains 1–4	+ operation
mbd.Ws_tot	0	J	Total elastic strain energy	Global	+ operation
mbd.Wk	0.5*mbd.rho*(mbd.u_tX^2+mbd.u_tY^2+mbd.u_tZ^2)	J/m³	Kinetic energy density	Domains 1–4	+ operation
mbd.Eequ	Inf	Pa	Equivalent Young's modulus	Domains 1–4	
mbd.nuequ	0	1	Equivalent Poisson's ratio	Domains 1–4	
mbd.Eequtot	mbd.Eequ	Pa	Total equivalent Young's modulus	Domains 1–4	+ operation
mbd.rho	material.rho	kg/m³	Density	Domains 1–4	Meta, * operation
mbd.u_ttX	d(d(mbd.rd2.Udx,TIME),TIME)	m/s²	Acceleration, X-component	Domains 1–4	
mbd.u_ttY	d(d(mbd.rd2.Udy,TIME),TIME)	m/s²			

			Acceleration, Y-component	Domains 1–4	
mbd.u_ttZ	d(d(mbd.rd2.Udz,TIME),TIME)	m/s²	Acceleration, Z-component	Domains 1–4	
mbd.u_tX	d(mbd.rd2.Udx,TIME)	m/s	Velocity, X-component	Domains 1–4	
mbd.u_tY	d(mbd.rd2.Udy,TIME)	m/s	Velocity, Y-component	Domains 1–4	
mbd.u_tZ	d(mbd.rd2.Udz,TIME)	m/s	Velocity, Z-component	Domains 1–4	
mbd.afX	0	m/s²	Frame acceleration, X-component	Domains 1–4	+ operation
mbd.afY	0	m/s²	Frame acceleration, Y-component	Domains 1–4	+ operation
mbd.afZ	0	m/s²	Frame acceleration, Z-component	Domains 1–4	+ operation
mbd.accX	mbd.u_ttX	m/s²	Effective acceleration, X-component	Domains 1–4	+ operation
mbd.accY	mbd.u_ttY	m/s²	Effective acceleration, Y-component	Domains 1–4	+ operation
mbd.accZ	mbd.u_ttZ	m/s²	Effective acceleration, Z-component	Domains 1–4	+ operation
mbd.vel	sqrteps(real(mbd.u_tX)^2+real(mbd.u_tY)^2+real(mbd.u_tZ)^2)	m/s	Velocity magnitude	Domains 1–4	
mbd.acc	sqrteps(real(mbd.accX)^2+real(mbd.accY)^2+real(mbd.accZ)^2)	m/s²	Effective acceleration magnitude	Domains 1–4	
mbd.u_tt	sqrteps(real(mbd.u_ttX)^2+real(mbd.u_ttY)^2+real(mbd.u_ttZ)^2)	m/s²	Acceleration magnitude	Domains 1–4	
mbd.rd2.xcx	mbd.rd2.xmx	m	Center of rotation, x-component	Global	
mbd.rd2.xcy	mbd.rd2.xmy	m	Center of rotation, y-component	Global	
mbd.rd2.xcz	mbd.rd2.xmz	m	Center of rotation, z-component	Global	
mbd.rd2.rotxx	cos(mbd.rd2.phi)	1	Rotation matrix, xx-component	Global	
mbd.rd2.rotyx	sin(mbd.rd2.phi)	1	Rotation matrix, yx-component	Global	
mbd.rd2.rotzx	0	1	Rotation matrix, zx-component	Global	
mbd.rd2.rotxy	-sin(mbd.rd2.phi)	1	Rotation matrix, xy-component	Global	
mbd.rd2.rotyy	cos(mbd.rd2.phi)	1	Rotation matrix, yy-component	Global	
mbd.rd2.rotzy	0	1	Rotation matrix, zy-component	Global	
mbd.rd2.rotxz	0	1	Rotation matrix, xz-component	Global	
mbd.rd2.rotyz	0	1	Rotation matrix, yz-component	Global	
mbd.rd2.rotzz	1	1	Rotation matrix, zz-component	Global	
mbd.rd2.u_tx	d(mbd.rd2.u,TIME)	m/s	Rigid body velocity, x-component	Global	
mbd.rd2.u_ty	d(mbd.rd2.v,TIME)	m/s	Rigid body velocity, y-component	Global	
mbd.rd2.u_tz	0	m/s	Rigid body velocity, z-component	Global	
mbd.rd2.th_tx	d(mbd.rd2.thx,TIME)	rad/s	Rigid body angular velocity, x-component	Global	
mbd.rd2.th_ty	d(mbd.rd2.thy,TIME)	rad/s	Rigid body angular velocity, y-component	Global	
mbd.rd2.th_tz	d(mbd.rd2.thz,TIME)	rad/s	Rigid body angular velocity, z-component	Global	
mbd.phase	if(isdefined(phase),phase,0)	1	Phase	Global	
mbd.rd2.RMmax	mbd.rd2.xcx+mbd.rd2.u-mbd.refpntx	m	Moment arm, x-component	Global	
mbd.rd2.RMmay	mbd.rd2.xcy+mbd.rd2.v-mbd.refpnty	m	Moment arm, y-component	Global	
mbd.rd2.RMmaz	0	m	Moment arm, z-component	Global	
mbd.rd2.xmx	mbd.rd2.int((mbd.rho+eps)*mbd.d*X)/mbd.rd2.int((mbd.rho+eps)*mbd.d)	m	Center of mass, x-component	Global	
mbd.rd2.xmy	mbd.rd2.int((mbd.rho+eps)*mbd.d*Y)/mbd.rd2.int((mbd.rho+eps)*mbd.d)	m	Center of mass, y-component	Global	

mbd.rd2.xmz	0	m	Center of mass, z-component	Global	
mbd.rd2.Iz	mbd.rd2.int(((X-mbd.rd2.xmx)^2+(Y-mbd.rd2.xmy)^2+mbd.rd2.xmz^2)*mbd.rho*mbd.d)	kg·m²	Moment of inertia	Global	
mbd.rd2.um	mbd.rd2.u	m	Rigid body displacement, x-component	Global	
mbd.rd2.vm	mbd.rd2.v	m	Rigid body displacement, y-component	Global	
mbd.rd2.wm	0	m	Rigid body displacement, z-component	Global	
mbd.rd2.m	mbd.rd2.int(mbd.rho*mbd.d)	kg	Mass	Global	
mbd.rd2.Udx	mbd.rd2.rotxx*(X-mbd.rd2.xcx)+mbd.rd2.rotxy*(Y-mbd.rd2.xcy)-mbd.rd2.rotxz*mbd.rd2.xcz-X+mbd.rd2.xcx+mbd.rd2.u	m	Domain displacement, x-component	Domains 1–4	+ operation
mbd.rd2.Udy	mbd.rd2.rotyx*(X-mbd.rd2.xcx)+mbd.rd2.rotyy*(Y-mbd.rd2.xcy)-mbd.rd2.rotyz*mbd.rd2.xcz-Y+mbd.rd2.xcy+mbd.rd2.v	m	Domain displacement, y-component	Domains 1–4	+ operation
mbd.rd2.Udz	mbd.rd2.rotzx*(X-mbd.rd2.xcx)+mbd.rd2.rotzy*(Y-mbd.rd2.xcy)-mbd.rd2.rotzz*mbd.rd2.xcz+mbd.rd2.xcz	m	Domain displacement, z-component	Domains 1–4	+ operation
mbd.rd2.thx	0	rad	Rigid body rotation, x-component	Global	
mbd.rd2.thy	0	rad	Rigid body rotation, y-component	Global	
mbd.rd2.thz	mbd.rd2.phi	rad	Rigid body rotation, z-component	Global	
mbd.rd2.u_ttx	d(mbd.rd2.u_tx,TIME)	m/s²	Rigid body acceleration, x-component	Global	
mbd.rd2.u_tty	d(mbd.rd2.u_ty,TIME)	m/s²	Rigid body acceleration, y-component	Global	
mbd.rd2.u_ttz	d(mbd.rd2.u_tz,TIME)	m/s²	Rigid body acceleration, z-component	Global	
mbd.rd2.um_ttx	d(d(mbd.rd2.um,TIME),TIME)	m/s²	Rigid body acceleration, x-component	Global	
mbd.rd2.um_tty	d(d(mbd.rd2.vm,TIME),TIME)	m/s²	Rigid body acceleration, y-component	Global	
mbd.rd2.um_ttz	d(d(mbd.rd2.wm,TIME),TIME)	m/s²	Rigid body acceleration, z-component	Global	
mbd.rd2.th_ttx	d(mbd.rd2.th_tx,TIME)	rad/s²	Rigid body angular acceleration, x-component	Global	
mbd.rd2.th_tty	d(mbd.rd2.th_ty,TIME)	rad/s²	Rigid body angular acceleration, y-component	Global	
mbd.rd2.th_ttz	d(mbd.rd2.th_tz,TIME)	rad/s²	Rigid body angular acceleration, z-component	Global	
mbd.rd2.FIx	-mbd.rd2.m*mbd.rd2.um_ttx	N	Inertial force, x-component	Global	
mbd.rd2.FIy	-mbd.rd2.m*mbd.rd2.um_tty	N	Inertial force, y-component	Global	
mbd.rd2.FIz	0	N	Inertial force, z-component	Global	
mbd.rd2.MIz	-mbd.rd2.Iz*d(d(mbd.rd2.phi,TIME),TIME)	N·m	Inertial moment	Global	
mbd.rd2.i_rot	1	1	Free rotation indicator	Global	* operation

Shape functions

Name	Shape function	Unit	Description	Shape frame	Selection
mbd.rd2.phi	ODE	rad	Rigid body rotation		Global
mbd.rd2.u	ODE	m	Rigid body displacement, x-component		Global
mbd.rd2.v	ODE	m	Rigid body displacement, y-component		Global

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
mbd.rd2.FIx*test(mbd.rd2.um)+mbd.rd2.FIy*test(mbd.rd2.vm)+mbd.rd2.FIz*test(mbd.rd2.wm)	2		Global
mbd.rd2.MIz*test(mbd.rd2.phi)	2		Global

Constraints

Constraint	Constraint force	Shape function	Selection	Details
up(u)-down(u)	test(up(u)-down(u))	Lagrange (Linear)	No boundaries	Elemental
up(v)-down(v)	test(up(v)-down(v))	Lagrange (Linear)	No boundaries	Elemental
0	0		No boundaries	Elemental

Mass and Moment of Inertia 1

Selection

| Geometric entity level | Entire model |

Equations

$$\mathbf{F}_I = m\left(\frac{d^2}{dt^2}\big(\mathbf{u} + (\mathbf{R} - \mathbf{E}_3)\mathbf{X}_{mc}\big)\right)$$

$$M_I = I_z\frac{d^2\phi}{dt^2} + \big((\mathbf{R}\mathbf{X}_{mc}) \times \mathbf{F}_I\big)\cdot\mathbf{e}_z$$

$$\mathbf{X}_{mc} = \mathbf{X}_m - \mathbf{X}_M$$

$$\mathbf{X}_m = \frac{\sum\mathbf{X}_i}{n}$$

Center of Mass

Settings

Description	Value
Center of mass	Centroid of selected entities
Entity level	Point
Offset	Off

Mass and Moment of Inertia

Settings

Description	Value	Unit
Mass	mtot*gamma	kg
Moment of inertia	0	kg·m²

Frame Acceleration Forces

Settings

Description	Value
Exclude contribution	On

Variables

Name	Expression	Unit	Description	Selection	De
mbd.Wk_tot	0.5*(mbd.rd2.mmi1.mt*(d(mbd.rd2.u+mbd.rd2.mmi1.dMrotx,TIME)^2+d(mbd.rd2.v+mbd.rd2.mmi1.dMroty,TIME)^2+d(mbd.rd2.mmi1.dMrotz,TIME)^2)+mbd.rd2.mmi1.Iz*d(mbd.rd2.phi,TIME)^2)	J	Total kinetic energy	Global	+ op
mbd.rd2.mmi1.mt	mtot*gamma	kg	Mass	Global	
mbd.rd2.mmi1.Iz	0	kg·m²	Moment of inertia	Global	
mbd.rd2.mmi1.xmsx	mbd.rd2.xcx+mbd.rd2.u+mbd.rd2.rotxx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotxy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotxz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Global coordinates of center of mass, x-component	Global	
mbd.rd2.mmi1.xmsy	mbd.rd2.xcy+mbd.rd2.v+mbd.rd2.rotyx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotyy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotyz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Global coordinates of center of mass, y-component	Global	
mbd.rd2.mmi1.xmsz	mbd.rd2.xcz+mbd.rd2.rotzx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotzy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotzz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Global coordinates of center of mass, z-component	Global	
mbd.rd2.mmi1.umx	mbd.rd2.u+mbd.rd2.rotxx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotxy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotxz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)-mbd.rd2.mmi1.xmx+mbd.rd2.xcx	m	Displacement at center of mass, x-component	Global	
mbd.rd2.mmi1.umy	mbd.rd2.v+mbd.rd2.rotyx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotyy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotyz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)-mbd.rd2.mmi1.xmy+mbd.rd2.xcy	m	Displacement at center of mass, y-component	Global	
mbd.rd2.mmi1.umz	mbd.rd2.rotzx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotzy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotzz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)-mbd.rd2.mmi1.xmz+mbd.rd2.xcz	m	Displacement at center of mass, z-component	Global	
mbd.rd2.mmi1.FIx	-mbd.rd2.mmi1.mt*d(d(mbd.rd2.u+mbd.rd2.mmi1.dMrotx,TIME),TIME)	N	Inertial force, x-component	Global	
mbd.rd2.mmi1.FIy	-mbd.rd2.mmi1.mt*d(d(mbd.rd2.v+mbd.rd2.mmi1.dMroty,TIME),TIME)	N		Global	

			Inertial force, y-component		
mbd.rd2.mmi1.FIz	-mbd.rd2.mmi1.mt*d(d(mbd.rd2.mmi1.dMrotz,TIME),TIME)	N	Inertial force, z-component	Global	
mbd.rd2.mmi1.MIz	-mbd.rd2.mmi1.Iz*d(d(mbd.rd2.phi,TIME),TIME)	N·m	Inertial moment	Global	
mbd.rd2.mmi1.dMx	mbd.rd2.mmi1.xmx-mbd.rd2.xcx	m	Mass offset from CoR, Original, x-component	Global	
mbd.rd2.mmi1.dMy	mbd.rd2.mmi1.xmy-mbd.rd2.xcy	m	Mass offset from CoR, Original, y-component	Global	
mbd.rd2.mmi1.dMz	mbd.rd2.mmi1.xmz-mbd.rd2.xcz	m	Mass offset from CoR, Original, z-component	Global	
mbd.rd2.mmi1.dMrotx	mbd.rd2.rotxx*mbd.rd2.mmi1.dMx+mbd.rd2.rotxy*mbd.rd2.mmi1.dMy+mbd.rd2.rotxz*mbd.rd2.mmi1.dMz	m	Mass offset from CoR, Rotated, x-component	Global	
mbd.rd2.mmi1.dMroty	mbd.rd2.rotyx*mbd.rd2.mmi1.dMx+mbd.rd2.rotyy*mbd.rd2.mmi1.dMy+mbd.rd2.rotyz*mbd.rd2.mmi1.dMz	m	Mass offset from CoR, Rotated, y-component	Global	
mbd.rd2.mmi1.dMrotz	mbd.rd2.rotzx*mbd.rd2.mmi1.dMx+mbd.rd2.rotzy*mbd.rd2.mmi1.dMy+mbd.rd2.rotzz*mbd.rd2.mmi1.dMz	m	Mass offset from CoR, Rotated, z-component	Global	
mbd.rd2.mmi1.Fx	mbd.rd2.mmi1.FIx	N	Applied force, x-component	Global	
mbd.rd2.mmi1.Fy	mbd.rd2.mmi1.FIy	N	Applied force, y-component	Global	
mbd.rd2.mmi1.Fz	mbd.rd2.mmi1.FIz	N	Applied force, z-component	Global	
mbd.rd2.mmi1.F_Mag	sqrt(real(mbd.rd2.mmi1.Fx)^2+real(mbd.rd2.mmi1.Fy)^2+real(mbd.rd2.mmi1.Fz)^2)	N	Load magnitude	Global	
mbd.rd2.mmi1.Mx	0	N·m	Applied moment, x-component	Global	
mbd.rd2.mmi1.My	0	N·m	Applied moment, y-component	Global	
mbd.rd2.mmi1.Mz	mbd.rd2.mmi1.MIz	N·m	Applied moment, z-component	Global	
mbd.rd2.mmi1.M_Mag	sqrt(real(mbd.rd2.mmi1.Mx)^2+real(mbd.rd2.mmi1.My)^2+real(mbd.rd2.mmi1.Mz)^2)	N·m	Moment magnitude	Global	
mbd.rd2.mmi1.loadposx	mbd.rd2.xcx+mbd.rd2.u+mbd.rd2.rotxx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotxy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotxz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Load position, x-component	Global	
mbd.rd2.mmi1.loadposy	mbd.rd2.xcy+mbd.rd2.v+mbd.rd2.rotyx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotyy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotyz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Load position, y-component	Global	
mbd.rd2.mmi1.loadposz	mbd.rd2.xcz+mbd.rd2.rotzx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotzy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotzz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Load position, z-component	Global	
mbd.rd2.mmi1.momposx	mbd.rd2.xcx+mbd.rd2.u+mbd.rd2.rotxx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotxy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotxz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Moment position, x-component	Global	
mbd.rd2.mmi1.momposy	mbd.rd2.xcy+mbd.rd2.v+mbd.rd2.rotyx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotyy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotyz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Moment position, y-component	Global	
mbd.rd2.mmi1.momposz	mbd.rd2.xcz+mbd.rd2.rotzx*(mbd.rd2.mmi1.xmx-mbd.rd2.xcx)+mbd.rd2.rotzy*(mbd.rd2.mmi1.xmy-mbd.rd2.xcy)+mbd.rd2.rotzz*(mbd.rd2.mmi1.xmz-mbd.rd2.xcz)	m	Moment position, z-component	Global	

Weak Expressions

Weak expression	Integration order	Integration frame	Selection

| mbd.rd2.mmi1.FIx*test(mbd.rd2.u+mbd.rd2.mmi1.dMrotx)+mbd.rd2.mmi1.FIy*test(mbd.rd2.v+mbd.rd2.mmi1.dMroty)+mbd.rd2.mmi1.FIz*test(mbd.rd2.mmi1.dMrotz) | 2 | | Global |
| mbd.rd2.mmi1.MIz*test(mbd.rd2.phi) | 2 | | Global |

Center of Mass: Point 1
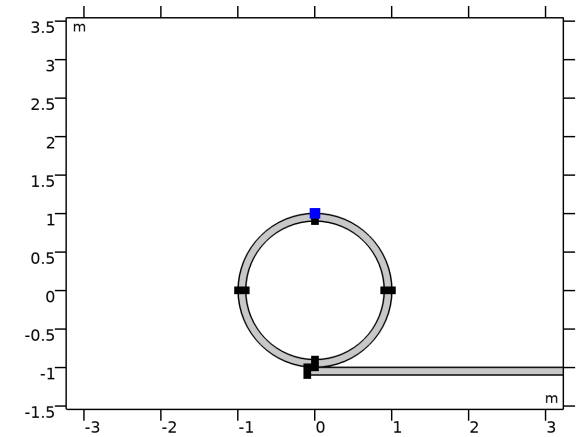
Center of Mass: Point 1

Selection	
Geometric entity level	Point
Selection	Geometry geom1: Dimension 0: Point 6

Variables

Name	Expression	Unit	Description	Selection	Details
mbd.rd2.mmi1.xmx	mbd.rd2.mmi1.cmp1.int(X)/mbd.rd2.mmi1.cmp1.int(1)	m	Global coordinates of center of mass, x-component	Global	+ operation
mbd.rd2.mmi1.xmy	mbd.rd2.mmi1.cmp1.int(Y)/mbd.rd2.mmi1.cmp1.int(1)	m	Global coordinates of center of mass, y-component	Global	+ operation
mbd.rd2.mmi1.xmz	mbd.rd2.mmi1.cmp1.int(0)/mbd.rd2.mmi1.cmp1.int(1)	m	Global coordinates of center of mass, z-component	Global	+ operation

2.4.9. Added Mass 1
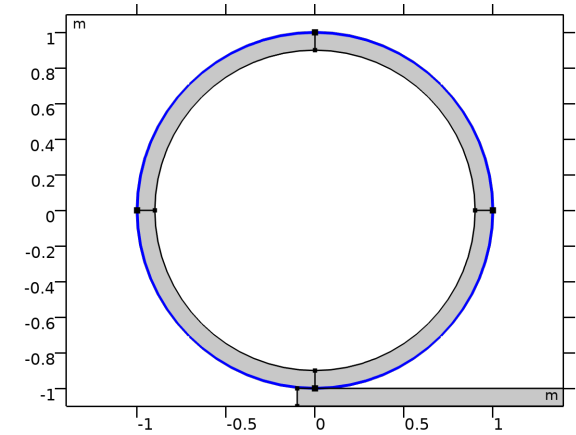
Added Mass 1

Selection	
Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 5–6, 9, 12

Equations

$$\mathbf{F}_L = -\frac{\mathbf{m}}{L}\left(\frac{\partial^2 \mathbf{u}}{\partial t^2} + \mathbf{a}_f\right)$$

Added Mass

Settings		
Description	**Value**	**Unit**
Mass type	Total mass	

Total mass, XX-component	mtot*(1 - gamma)	kg

Frame Acceleration Forces

Settings

Description	Value
Exclude contribution	Off

Coordinate System Selection

Settings

Description	Value
Coordinate system	Global coordinate system

Variables

Name	Expression	Unit	Descr
mbd.Wk_tot	mbd.adm1.int(0.5*((mbd.adm1.mPerLineXX*d(u,TIME)+mbd.adm1.mPerLineXY*d(v,TIME))*d(u,TIME)+ (mbd.adm1.mPerLineXY*d(u,TIME)+mbd.adm1.mPerLineYY*d(v,TIME))*d(v,TIME)))	J	Total energy
mbd.adm1.mPerLineXX	mbd.adm1.mTotXX/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mPerLineXY	mbd.adm1.mTotXY/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mPerLineXZ	mbd.adm1.mTotXZ/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mPerLineYY	mbd.adm1.mTotYY/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mPerLineYZ	mbd.adm1.mTotYZ/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mPerLineZZ	mbd.adm1.mTotZZ/mbd.adm1.selL	kg/m	Mass length compo
mbd.adm1.mTotXX	mtot*(1-gamma)	kg	Total XX-compo
mbd.adm1.mTotXY	0	kg	Total XY-compo
mbd.adm1.mTotXZ	0	kg	Total XZ-compo
mbd.adm1.mTotYY	mtot*(1-gamma)	kg	Total YY-compo
mbd.adm1.mTotYZ	0	kg	Total YZ-compo
mbd.adm1.mTotZZ	mtot*(1-gamma)	kg	Total ZZ-compo
mbd.adm1.FperLengthX	mbd.adm1.mPerLineXX*mbd.adm1.accX+mbd.adm1.mPerLineXY*mbd.adm1.accY+mbd.adm1.mPerLineXZ*mbd.adm1.accZ	N/m	Load, X-con
mbd.adm1.FperLengthY	mbd.adm1.mPerLineXY*mbd.adm1.accX+mbd.adm1.mPerLineYY*mbd.adm1.accY+mbd.adm1.mPerLineYZ*mbd.adm1.accZ	N/m	Load, Y-con
mbd.adm1.FperLengthZ	mbd.adm1.mPerLineXZ*mbd.adm1.accX+mbd.adm1.mPerLineYZ*mbd.adm1.accY+mbd.adm1.mPerLineZZ*mbd.adm1.accZ	N/m	Load, Z-con
mbd.adm1.selL	mbd.adm1.int(1)	m	Select length
mbd.adm1.accX	mbd.accX	m/s²	Accel X-con
mbd.adm1.accY	mbd.accY	m/s²	Accel Y-con
mbd.adm1.accZ	mbd.accZ	m/s²	Accel Z-con
mbd.adm1.afX	mbd.afX	m/s²	Frame accele X-con
mbd.adm1.afY	mbd.afY	m/s²	

			Frame accele Y-con
mbd.adm1.afZ	mbd.afZ	m/s²	Frame accele Z-con
mbd.adm1.F_AX	-(mbd.adm1.mPerLineXX*mbd.adm1.afX+mbd.adm1.mPerLineXY*mbd.adm1.afY+mbd.adm1.mPerLineXZ*mbd.adm1.afZ)/mbd.d	N/m²	Load, X-con
mbd.adm1.F_AY	-(mbd.adm1.mPerLineXY*mbd.adm1.afX+mbd.adm1.mPerLineYY*mbd.adm1.afY+mbd.adm1.mPerLineYZ*mbd.adm1.afZ)/mbd.d	N/m²	Load, Y-con
mbd.adm1.F_AZ	-(mbd.adm1.mPerLineXZ*mbd.adm1.afX+mbd.adm1.mPerLineYZ*mbd.adm1.afY+mbd.adm1.mPerLineZZ*mbd.adm1.afZ)/mbd.d	N/m²	Load, Z-con
mbd.adm1.F_A_Mag	sqrteps(real(mbd.adm1.F_AX)^2+real(mbd.adm1.F_AY)^2+real(mbd.adm1.F_AZ)^2)	N/m²	Load magni

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
-mbd.adm1.FperLengthX*test(u)-mbd.adm1.FperLengthY*test(v)	2	Material	Boundaries 5–6, 9, 12

2.4.10. Boundary Load 1
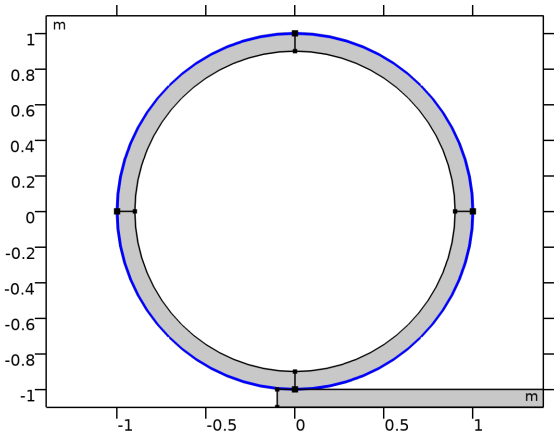
Boundary Load 1

Selection	
Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 5–6, 9, 12

Equations

$$S \cdot \mathbf{n} = \mathbf{F}_A$$

$$\mathbf{F}_A = \frac{\mathbf{F}_{tot}}{A}$$

Force

Settings		
Description	Value	Unit
Load type	Total force	
Total force, x-component	0	N
Total force, y-component	-mtot*(1 - gamma)*g_const	N
Total force, z-component	0	N
Force, x-component	0	N
Force, y-component	0	N
Force, z-component	0	N
Moment, x-component	0	N·m
Moment, y-component	0	N·m
Moment, z-component	0	N·m
Application point defined using	Centroid	

Coordinate System Selection

Settings	
Description	Value

Coordinate system	Global coordinate system

Variables

Name	Expression	Unit	Description	Selection	Details
mbd.bndl1.Ftotx	0	N	Total force, x-component	Boundaries 5–6, 9, 12	* operation
mbd.bndl1.Ftoty	-mtot*(1-gamma)*g_const	N	Total force, y-component	Boundaries 5–6, 9, 12	* operation
mbd.bndl1.Ftotz	0	N	Total force, z-component	Boundaries 5–6, 9, 12	* operation
mbd.bndl1.ux	u	m	Displacement, x-component	Boundaries 5–6, 9, 12	
mbd.bndl1.uy	v	m	Displacement, y-component	Boundaries 5–6, 9, 12	
mbd.bndl1.uz	0	m	Displacement, z-component	Boundaries 5–6, 9, 12	
mbd.bndl1.F_Ax	mbd.bndl1.Ftotx/mbd.bndl1.selA	N/m²	Load, x-component	Boundaries 5–6, 9, 12	
mbd.bndl1.F_Ay	mbd.bndl1.Ftoty/mbd.bndl1.selA	N/m²	Load, y-component	Boundaries 5–6, 9, 12	
mbd.bndl1.F_Az	0	N/m²	Load, z-component	Boundaries 5–6, 9, 12	
mbd.bndl1.F_A_Mag	sqrteps(real(mbd.bndl1.F_Ax)^2+real(mbd.bndl1.F_Ay)^2+real(mbd.bndl1.F_Az)^2)	N/m²	Load magnitude	Boundaries 5–6, 9, 12	
mbd.F_Ax	mbd.bndl1.Ftotx/mbd.bndl1.selA	N/m²	Load, x-component	Boundaries 5–6, 9, 12	+ operation
mbd.F_Ay	mbd.bndl1.Ftoty/mbd.bndl1.selA	N/m²	Load, y-component	Boundaries 5–6, 9, 12	+ operation
mbd.F_Az	0	N/m²	Load, z-component	Boundaries 5–6, 9, 12	+ operation
mbd.F_A_Mag	sqrteps(real(mbd.F_Ax)^2+real(mbd.F_Ay)^2+real(mbd.F_Az)^2)	N/m²	Load magnitude	Boundaries 5–6, 9, 12	
mbd.bndl1.selA	mbd.bndl1.intop1(1)*mbd.d	m²	Selection area	Boundaries 5–6, 9, 12	

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
mbd.d*(mbd.bndl1.F_Ax*test(mbd.bndl1.ux)+mbd.bndl1.F_Ay*test(mbd.bndl1.uy)+mbd.bndl1.F_Az*test(mbd.bndl1.uz))	2	Material	Boundaries 5–6, 9, 12

2.4.11. Point Load 1
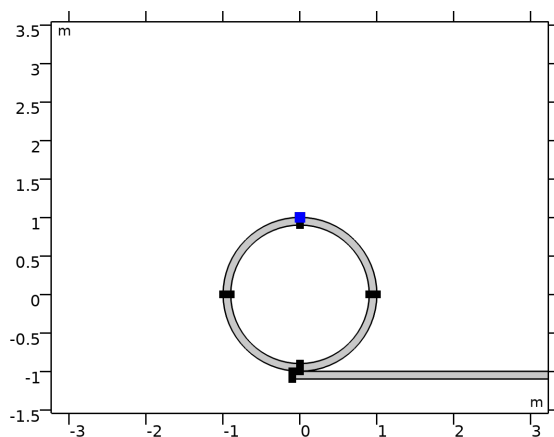
Point Load 1

	Selection
Geometric entity level	Point
Selection	Geometry geom1: Dimension 0: Point 6

Equations

$$\mathbf{F} = \mathbf{F}_P$$

Force

Settings

Description	Value	Unit
Load type	Force per point	
Point load	User defined	
Point load	{0, -mtot*gamma*g_const, 0}	N

Coordinate System Selection

Settings

Description	Value
Coordinate system	Global coordinate system

Variables

Name	Expression	Unit	Description	Selection	Details
mbd.pl1.ux	u	m	Displacement, x-component	Point 6	
mbd.pl1.uy	v	m	Displacement, y-component	Point 6	
mbd.pl1.uz	0	m	Displacement, z-component	Point 6	
mbd.pl1.Fpx	0	N	Point load, x-component	Point 6	* operation
mbd.pl1.Fpy	-mtot*gamma*g_const	N	Point load, y-component	Point 6	* operation
mbd.pl1.Fpz	0	N	Point load, z-component	Point 6	* operation
mbd.pl1.F_Px	mbd.pl1.Fpx	N	Load, x-component	Point 6	
mbd.pl1.F_Py	mbd.pl1.Fpy	N	Load, y-component	Point 6	
mbd.pl1.F_Pz	0	N	Load, z-component	Point 6	
mbd.F_Px	mbd.pl1.Fpx	N	Load, x-component	Point 6	+ operation
mbd.F_Py	mbd.pl1.Fpy	N	Load, y-component	Point 6	+ operation
mbd.F_Pz	0	N	Load, z-component	Point 6	+ operation
mbd.pl1.F_P_Mag	sqrteps(real(mbd.pl1.F_Px)^2+real(mbd.pl1.F_Py)^2+real(mbd.pl1.F_Pz)^2)	N	Load magnitude	Point 6	
mbd.F_P_Mag	sqrteps(real(mbd.F_Px)^2+real(mbd.F_Py)^2+real(mbd.F_Pz)^2)	N	Load magnitude	Point 6	

Weak Expressions

Weak expression	Integration order	Integration frame	Selection
mbd.pl1.F_Px*test(mbd.pl1.ux)+mbd.pl1.F_Py*test(mbd.pl1.uy)+mbd.pl1.F_Pz*test(mbd.pl1.uz)	2	Material	Point 6

2.5. Mesh 1
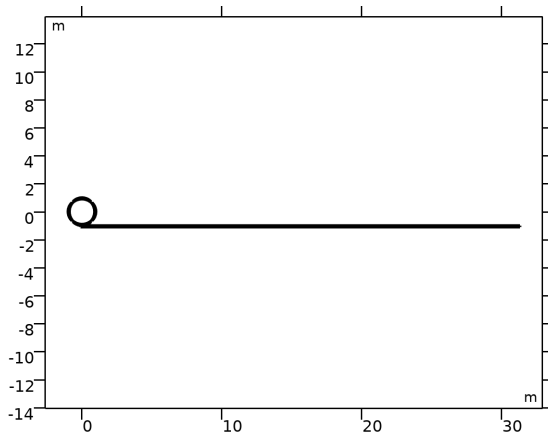
Mesh 1

Mesh statistics

Description	Value
Status	Complete mesh
Mesh vertices	84
Quads	41
Edge elements	88
Vertex elements	12
Number of elements	41
Minimum element quality	0.95
Average element quality	0.9512

Element area ratio	0.0047295
Mesh area	3.736 m²

2.5.1. Size (size)

Settings

Description	Value
Maximum element size	2.17
Minimum element size	0.00969
Curvature factor	0.3
Maximum element growth rate	1.3

2.5.2. Edge 1 (edg1)

Selection

Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 5–12

Edge 1

Settings

Description	Value
Number of iterations	4
Maximum element depth to process	4

Information

Description	Value
Last build time	< 1 second
Built with	COMSOL 6.1.0.252 (win64), Mar 7, 2023, 8:57:33 AM

Distribution 1 (dis1)

Selection

Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 5–12

Distribution 1

Settings

Description	Value
Number of elements	10

2.5.3. Mapped 1 (map1)

Selection

Geometric entity level	Domain
Selection	Remaining
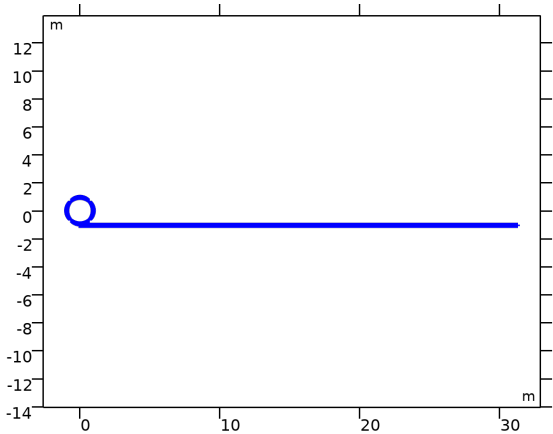
Mapped 1

Settings

Description	Value
Number of iterations	4
Maximum element depth to process	4

Information

Description	Value
Last build time	< 1 second
Built with	COMSOL 6.1.0.252 (win64), Mar 7, 2023, 8:57:33 AM

Distribution 1 (dis1)

Selection

Geometric entity level	Boundary
Selection	Geometry geom1: Dimension 1: Boundaries 1–4, 13–14
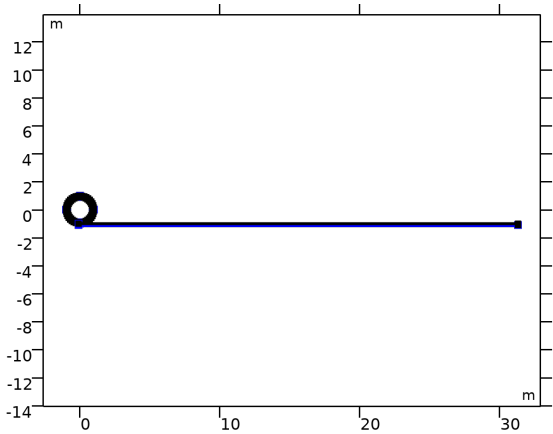
Distribution 1

Settings

Description	Value
Number of elements	1

3. Study 1

Computation information

Computation time	41 min 50 s

3.1. Parametric Sweep

Parameter name	Parameter value list	Parameter unit
v0	0.1 1 2 2.8 3.1 3.5	m/s

Study settings

Description	Value
Sweep type	Specified combinations
Parameter name	v0
Unit	m/s

Parameters

Parameter name	Parameter value list	Parameter unit
v0 (Initial velocity)	0.1 1 2 2.8 3.1 3.5	m/s

3.2. Time Dependent

Times	Unit
range(0,dt,t_end)	s

Study settings

Description	Value
Include geometric nonlinearity	On

Study settings

Description	Value
Output times	{0, 0.0036191, 0.0072382, 0.010857, 0.014476, 0.018096, 0.021715, 0.025334, 0.028953, 0.032572, 0.036191, 0.03981, 0.043429, 0.047049, 0.050668, 0.054287, 0.057906, 0.061525, 0.065144, 0.068763, 0.072382, 0.076002, 0.079621, 0.08324, 0.086859, 0.090478, 0.094097, 0.097716, 0.10134, 0.10495, 0.10857, 0.11219, 0.11581, 0.11943, 0.12305, 0.12667, 0.13029, 0.13391, 0.13753, 0.14115, 0.14476, 0.14838, 0.152, 0.15562, 0.15924, 0.16286, 0.16648, 0.1701, 0.17372, 0.17734, 0.18096, 0.18458, 0.18819, 0.19181, 0.19543, 0.19905, 0.20267, 0.20629, 0.20991, 0.21353, 0.21715, 0.22077, 0.22439, 0.228, 0.23162, 0.23524, 0.23886, 0.24248, 0.2461, 0.24972, 0.25334, 0.25696, 0.26058, 0.2642, 0.26782, 0.27143, 0.27505, 0.27867, 0.28229, 0.28591, 0.28953, 0.29315, 0.29677, 0.30039, 0.30401, 0.30763, 0.31124, 0.31486, 0.31848, 0.3221, 0.32572, 0.32934, 0.33296, 0.33658, 0.3402, 0.34382, 0.34744, 0.35105, 0.35467, 0.35829, 0.36191, 0.36553, 0.36915, 0.37277, 0.37639, 0.38001, 0.38363, 0.38725, 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15.016, 15.019, 15.023, 15.027, 15.03, 15.034, 15.037, 15.041, 15.045, 15.048, 15.052, 15.056, 15.059, 15.063, 15.066, 15.07, 15.074, 15.077, 15.081, 15.085, 15.088, 15.092, 15.095, 15.099, 15.103, 15.106, 15.11, 15.113, 15.117, 15.121, 15.124, 15.128, 15.132, 15.135, 15.139, 15.142, 15.146, 15.15, 15.153, 15.157, 15.161, 15.164, 15.168, 15.171, 15.175, 15.179, 15.182, 15.186, 15.189, 15.193, 15.197, 15.2, 15.204, 15.208, 15.211, 15.215, 15.218, 15.222, 15.226, 15.229, 15.233, 15.237, 15.24, 15.244, 15.247, 15.251, 15.255, 15.258, 15.262, 15.265, 15.269, 15.273, 15.276, 15.28, 15.284, 15.287, 15.291, 15.294, 15.298, 15.302, 15.305, 15.309, 15.313, 15.316, 15.32, 15.323, 15.327, 15.331, 15.334, 15.338, 15.341, 15.345, 15.349, 15.352, 15.356, 15.36, 15.363, 15.367, 15.37, 15.374, 15.378, 15.381, 15.385, 15.389, 15.392, 15.396, 15.399, 15.403, 15.407, 15.41, 15.414, 15.417, 15.421, 15.425, 15.428, 15.432, 15.436, 15.439, 15.443, 15.446, 15.45, 15.454, 15.457, 15.461, 15.465, 15.468, 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16.843, 16.847, 16.851, 16.854, 16.858, 16.861, 16.865, 16.869, 16.872, 16.876, 16.88, 16.883, 16.887, 16.89, 16.894, 16.898, 16.901, 16.905, 16.909, 16.912, 16.916, 16.919, 16.923, 16.927, 16.93, 16.934, 16.937, 16.941, 16.945, 16.948, 16.952, 16.956, 16.959, 16.963, 16.966, 16.97, 16.974, 16.977, 16.981, 16.985, 16.988, 16.992, 16.995, 16.999, 17.003, 17.006, 17.01, 17.013, 17.017, 17.021, 17.024, 17.028, 17.032, 17.035, 17.039, 17.042, 17.046, 17.05, 17.053, 17.057, 17.061, 17.064, 17.068, 17.071, 17.075, 17.079, 17.082, 17.086, 17.089, 17.093, 17.097, 17.1, 17.104, 17.108, 17.111, 17.115, 17.118, 17.122, 17.126, 17.129, 17.133, 17.137, 17.14, 17.144, 17.147, 17.151, 17.155, 17.158, 17.162, 17.166, 17.169, 17.173, 17.176, 17.18, 17.184, 17.187, 17.191, 17.194, 17.198, 17.202, 17.205, 17.209, 17.213, 17.216, 17.22, 17.223, 17.227, 17.231, 17.234, 17.238, 17.242, 17.245, 17.249, 17.252, 17.256, 17.26, 17.263, 17.267, 17.27, 17.274, 17.278, 17.281, 17.285, 17.289, 17.292, 17.296, 17.299, 17.303, 17.307, 17.31, 17.314, 17.318, 17.321, 17.325, 17.328, 17.332, 17.336, 17.339, 17.343, 17.346, 17.35, 17.354, 17.357, 17.361, 17.365, 17.368, 17.372, 17.375, 17.379, 17.383, 17.386, 17.39, 17.394, 17.397, 17.401, 17.404, 17.408, 17.412, 17.415, 17.419, 17.422, 17.426, 17.43, 17.433, 17.437, 17.441, 17.444, 17.448, 17.451, 17.455, 17.459, 17.462, 17.466, 17.47, 17.473, 17.477, 17.48, 17.484, 17.488, 17.491, 17.495, 17.498, 17.502, 17.506, 17.509, 17.513, 17.517, 17.52, 17.524, 17.527, 17.531, 17.535, 17.538, 17.542, 17.546, 17.549, 17.553, 17.556, 17.56, 17.564, 17.567, 17.571, 17.574, 17.578, 17.582, 17.585, 17.589, 17.593, 17.596, 17.6, 17.603, 17.607, 17.611, 17.614, 17.618, 17.622, 17.625, 17.629, 17.632, 17.636, 17.64, 17.643, 17.647, 17.65, 17.654, 17.658, 17.661, 17.665, 17.669, 17.672, 17.676, 17.679, 17.683, 17.687, 17.69, 17.694, 17.698, 17.701, 17.705, 17.708, 17.712, 17.716, 17.719, 17.723, 17.726, 17.73, 17.734, 17.737, 17.741, 17.745, 17.748, 17.752, 17.755, 17.759, 17.763, 17.766, 17.77, 17.774, 17.777, 17.781, 17.784, 17.788, 17.792, 17.795, 17.799, 17.802, 17.806, 17.81, 17.813, 17.817, 17.821, 17.824, 17.828, 17.831, 17.835, 17.839, 17.842, 17.846, 17.85, 17.853, 17.857, 17.86, 17.864, 17.868, 17.871, 17.875, 17.878, 17.882, 17.886, 17.889, 17.893, 17.897, 17.9, 17.904, 17.907, 17.911, 17.915, 17.918, 17.922, 17.926, 17.929, 17.933, 17.936, 17.94, 17.944, 17.947, 17.951, 17.954, 17.958, 17.962, 17.965, 17.969, 17.973, 17.976, 17.98, 17.983, 17.987, 17.991, 17.994, 17.998, 18.002, 18.005, 18.009, 18.012, 18.016, 18.02, 18.023, 18.027, 18.03, 18.034, 18.038, 18.041, 18.045, 18.049, 18.052, 18.056, 18.059, 18.063, 18.067, 18.07, 18.074, 18.078, 18.081, 18.085, 18.088, 18.092, 18.096, 18.099, 18.103, 18.106, 18.11, 18.114, 18.117, 18.121, 18.125, 18.128, 18.132, 18.135, 18.139, 18.143, 18.146, 18.15, 18.154, 18.157, 18.161, 18.164, 18.168, 18.172, 18.175, 18.179, 18.182, 18.186, 18.19, 18.193, 18.197, 18.201, 18.204, 18.208, 18.211, 18.215, 18.219, 18.222, 18.226, 18.23, 18.233, 18.237, 18.24, 18.244, 18.248, 18.251, 18.255, 18.258, 18.262, 18.266, 18.269, 18.273, 18.277, 18.28, 18.284, 18.287, 18.291, 18.295, 18.298, 18.302, 18.306, 18.309, 18.313, 18.316, 18.32, 18.324, 18.327, 18.331, 18.334, 18.338, 18.342, 18.345, 18.349, 18.353, 18.356, 18.36, 18.363, 18.367, 18.371, 18.374, 18.378, 18.382, 18.385, 18.389, 18.392, 18.396, 18.4, 18.403, 18.407, 18.41, 18.414, 18.418, 18.421, 18.425, 18.429, 18.432, 18.436, 18.439, 18.443, 18.447, 18.45, 18.454, 18.458, 18.461, 18.465, 18.468, 18.472, 18.476, 18.479, 18.483, 18.486, 18.49, 18.494, 18.497, 18.501, 18.505, 18.508, 18.512, 18.515, 18.519, 18.523, 18.526, 18.53, 18.534, 18.537, 18.541, 18.544, 18.548, 18.552, 18.555, 18.559, 18.562, 18.566, 18.57, 18.573, 18.577, 18.581, 18.584, 18.588, 18.591, 18.595, 18.599, 18.602, 18.606, 18.61, 18.613, 18.617, 18.62, 18.624, 18.628, 18.631, 18.635, 18.638, 18.642, 18.646, 18.649, 18.653, 18.657, 18.66, 18.664, 18.667, 18.671, 18.675, 18.678, 18.682, 18.686, 18.689, 18.693, 18.696, 18.7, 18.704, 18.707, 18.711, 18.714, 18.718, 18.722, 18.725, 18.729, 18.733, 18.736, 18.74, 18.743, 18.747, 18.751}

Tolerance	User controlled
Relative tolerance	1E-4
Include geometric nonlinearity	On

Physics and variables selection

Physics interface	Solve for	Equation form
Multibody Dynamics (mbd)	On	Automatic (Time dependent)

Store in output

Interface	Output	Selection
Multibody Dynamics (mbd)	Physics controlled	

Mesh selection

Component	Mesh
Component 1	Mesh 1

3.3. Solver Configurations

3.3.1. Solution 1

Compile Equations: Time Dependent (st1)

Study and step

Description	Value
Use study	Study 1
Use study step	Time Dependent

Log
<---- Compile Equations: Time Dependent in Study 1/Solution 1 (sol1) -----------

Geometry shape function: Linear Lagrange
Parameter v0 = 3.5 (m/s).

53 GB

----- Compile Equations: Time Dependent in Study 1/Solution 1 (sol1) ---------->

Dependent Variables 1 (v1)

General

Description	Value
Defined by study step	Step 1: Time Dependent

Residual scaling

Description	Value
Method	Manual

Initial value calculation constants

Constant name	Initial value source
t	range(0,dt,t_end)
timestep	0.018751[s]

Log
<---- Dependent Variables 1 in Study 1/Solution 1 (sol1) ----------------------

Solution time: 0 s.

----- Dependent Variables 1 in Study 1/Solution 1 (sol1) ---------------------->

Displacement field (comp1.u) (comp1_u)

General

Description	Value
Field components	{comp1.u, comp1.v}

Scaling

Description	Value
Method	Manual
Scale	0.33534

Viscous energy dissipation (comp1.mbd.rbc1.Wv) (comp1_mbd_rbc1_Wv)

General

Description	Value
State components	comp1.mbd.rbc1.Wv

Scaling

Description	Value
Method	Manual

Frictional energy dissipation (comp1.mbd.rbc1.Wf) (comp1_mbd_rbc1_Wf)

General

Description	Value
State components	comp1.mbd.rbc1.Wf

Scaling

Description	Value
Method	Manual

Rigid body displacement (spatial frame) (comp1.mbd.rd1.u) (comp1_mbd_rd1_u)

General

Description	Value
State components	{comp1.mbd.rd1.u, comp1.mbd.rd1.v}

Scaling

Description	Value
Method	Manual
Scale	0.33534

Rigid body rotation (comp1.mbd.rd1.phi) (comp1_mbd_rd1_phi)

General

Description	Value
State components	comp1.mbd.rd1.phi

Scaling

Description	Value
Method	Manual
Scale	0.1

Rigid body displacement (spatial frame) (comp1.mbd.rd2.u) (comp1_mbd_rd2_u)

General

Description	Value
State components	{comp1.mbd.rd2.u, comp1.mbd.rd2.v}

Scaling

Description	Value
Method	Manual
Scale	0.33534

Rigid body rotation (comp1.mbd.rd2.phi) (comp1_mbd_rd2_phi)

General

Description	Value
State components	comp1.mbd.rd2.phi

Scaling

Description	Value
Method	Manual
Scale	0.1

Time-Dependent Solver 1 (t1)

General

Description	Value
Defined by study step	Step 1: Time Dependent
Output times	{0, 0.0036191, 0.0072382, 0.010857, 0.014476, 0.018096, 0.021715, 0.025334, 0.028953, 0.032572, 0.036191, 0.03981, 0.043429, 0.047049, 0.050668, 0.054287, 0.057906, 0.061525, 0.065144, 0.068763, 0.072382, 0.076002, 0.079621, 0.08324, 0.086859, 0.090478, 0.094097, 0.097716, 0.10134, 0.10495, 0.10857, 0.11219, 0.11581, 0.11943, 0.12305, 0.12667, 0.13029, 0.13391, 0.13753, 0.14115, 0.14476, 0.14838, 0.152, 0.15562, 0.15924, 0.16286, 0.16648, 0.1701, 0.17372, 0.17734, 0.18096, 0.18458, 0.18819, 0.19181, 0.19543, 0.19905, 0.20267, 0.20629, 0.20991, 0.21353, 0.21715, 0.22077, 0.22439, 0.228, 0.23162, 0.23524, 0.23886, 0.24248, 0.2461, 0.24972, 0.25334, 0.25696, 0.26058, 0.2642, 0.26782, 0.27143, 0.27505, 0.27867, 0.28229, 0.28591, 0.28953, 0.29315, 0.29677, 0.30039, 0.30401, 0.30763, 0.31124, 0.31486, 0.31848, 0.3221, 0.32572, 0.32934, 0.33296, 0.33658, 0.3402, 0.34382, 0.34744, 0.35105, 0.35467, 0.35829, 0.36191, 0.36553, 0.36915, 0.37277, 0.37639, 0.38001, 0.38363, 0.38725, 0.39087, 0.39448, 0.3981, 0.40172, 0.40534, 0.40896, 0.41258, 0.4162, 0.41982, 0.42344, 0.42706, 0.43068, 0.43429, 0.43791, 0.44153, 0.44515, 0.44877, 0.45239, 0.45601, 0.45963, 0.46325, 0.46687, 0.47049, 0.47411, 0.47772, 0.48134, 0.48496, 0.48858, 0.4922, 0.49582, 0.49944, 0.50306, 0.50668, 0.5103, 0.51392, 0.51753, 0.52115, 0.52477, 0.52839, 0.53201, 0.53563, 0.53925, 0.54287, 0.54649, 0.55011, 0.55373, 0.55734, 0.56096, 0.56458, 0.5682, 0.57182, 0.57544, 0.57906, 0.58268, 0.5863, 0.58992, 0.59354, 0.59716, 0.60077, 0.60439, 0.60801, 0.61163, 0.61525, 0.61887, 0.62249, 0.62611, 0.62973, 0.63335, 0.63697, 0.64058, 0.6442, 0.64782, 0.65144, 0.65506, 0.65868, 0.6623, 0.66592, 0.66954, 0.67316, 0.67678, 0.6804, 0.68401, 0.68763, 0.69125, 0.69487, 0.69849, 0.70211, 0.70573, 0.70935, 0.71297, 0.71659, 0.72021, 0.72382, 0.72744, 0.73106, 0.73468, 0.7383, 0.74192, 0.74554, 0.74916, 0.75278, 0.7564, 0.76002, 0.76363, 0.76725, 0.77087, 0.77449, 0.77811, 0.78173, 0.78535, 0.78897, 0.79259, 0.79621, 0.79983, 0.80345, 0.80706, 0.81068, 0.8143, 0.81792, 0.82154, 0.82516, 0.82878, 0.8324, 0.83602, 0.83964, 0.84326, 0.84687, 0.85049, 0.85411, 0.85773, 0.86135, 0.86497, 0.86859, 0.87221, 0.87583, 0.87945, 0.88307, 0.88669, 0.8903, 0.89392, 0.89754, 0.90116, 0.90478, 0.9084, 0.91202, 0.91564, 0.91926, 0.92288, 0.9265, 0.93011, 0.93373, 0.93735, 0.94097, 0.94459, 0.94821, 0.95183, 0.95545, 0.95907, 0.96269, 0.96631, 0.96992, 0.97354, 0.97716, 0.98078, 0.9844, 0.98802, 0.99164, 0.99526, 0.99888, 1.0025, 1.0061, 1.0097, 1.0134, 1.017, 1.0206, 1.0242, 1.0278, 1.0315, 1.0351, 1.0387, 1.0423, 1.0459, 1.0495, 1.0532, 1.0568, 1.0604, 1.064, 1.0676, 1.0713, 1.0749, 1.0785, 1.0821, 1.0857, 1.0894, 1.093, 1.0966, 1.1002, 1.1038, 1.1075, 1.1111, 1.1147, 1.1183, 1.1219, 1.1255, 1.1292, 1.1328, 1.1364, 1.14, 1.1436, 1.1473, 1.1509, 1.1545, 1.1581, 1.1617, 1.1654, 1.169, 1.1726, 1.1762, 1.1798, 1.1835, 1.1871, 1.1907, 1.1943, 1.1979, 1.2015, 1.2052, 1.2088, 1.2124, 1.216, 1.2196, 1.2233, 1.2269, 1.2305, 1.2341, 1.2377, 1.2414, 1.245, 1.2486, 1.2522, 1.2558, 1.2595, 1.2631, 1.2667, 1.2703, 1.2739, 1.2776, 1.2812, 1.2848, 1.2884, 1.292, 1.2956, 1.2993, 1.3029, 1.3065, 1.3101, 1.3137, 1.3174, 1.321, 1.3246, 1.3282, 1.3318, 1.3355, 1.3391, 1.3427, 1.3463, 1.3499, 1.3536, 1.3572, 1.3608, 1.3644, 1.368, 1.3716, 1.3753, 1.3789, 1.3825, 1.3861, 1.3897, 1.3934, 1.397, 1.4006, 1.4042, 1.4078, 1.4115, 1.4151, 1.4187, 1.4223, 1.4259, 1.4296, 1.4332, 1.4368, 1.4404, 1.444, 1.4476, 1.4513, 1.4549, 1.4585, 1.4621, 1.4657, 1.4694, 1.473, 1.4766, 1.4802, 1.4838, 1.4875, 1.4911, 1.4947, 1.4983, 1.5019, 1.5056, 1.5092, 1.5128, 1.5164, 1.52, 1.5237, 1.5273, 1.5309, 1.5345, 1.5381, 1.5417, 1.5454, 1.549, 1.5526, 1.5562, 1.5598, 1.5635, 1.5671, 1.5707, 1.5743, 1.5779, 1.5816, 1.5852, 1.5888, 1.5924, 1.596, 1.5997, 1.6033, 1.6069, 1.6105, 1.6141, 1.6177, 1.6214, 1.625, 1.6286, 1.6322, 1.6358, 1.6395, 1.6431, 1.6467, 1.6503, 1.6539, 1.6576, 1.6612, 1.6648, 1.6684, 1.672, 1.6757, 1.6793, 1.6829, 1.6865, 1.6901, 1.6937, 1.6974, 1.701, 1.7046, 1.7082, 1.7118, 1.7155, 1.7191,

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13.032, 13.036, 13.04, 13.043, 13.047, 13.051, 13.054, 13.058, 13.061, 13.065, 13.069, 13.072, 13.076, 13.08, 13.083, 13.087, 13.09, 13.094, 13.098, 13.101, 13.105, 13.108, 13.112, 13.116, 13.119, 13.123, 13.127, 13.13, 13.134, 13.137, 13.141, 13.145, 13.148, 13.152, 13.156, 13.159, 13.163, 13.166, 13.17, 13.174, 13.177, 13.181, 13.184, 13.188, 13.192, 13.195, 13.199, 13.203, 13.206, 13.21, 13.213, 13.217, 13.221, 13.224, 13.228, 13.232, 13.235, 13.239, 13.242, 13.246, 13.25, 13.253, 13.257, 13.26, 13.264, 13.268, 13.271, 13.275, 13.279, 13.282, 13.286, 13.289, 13.293, 13.297, 13.3, 13.304, 13.308, 13.311, 13.315, 13.318, 13.322, 13.326, 13.329, 13.333, 13.336, 13.34, 13.344, 13.347, 13.351, 13.355, 13.358, 13.362, 13.365, 13.369, 13.373, 13.376, 13.38, 13.384, 13.387, 13.391, 13.394, 13.398, 13.402, 13.405, 13.409, 13.412, 13.416, 13.42, 13.423, 13.427, 13.431, 13.434, 13.438, 13.441, 13.445, 13.449, 13.452, 13.456, 13.46, 13.463, 13.467, 13.47, 13.474, 13.478, 13.481, 13.485, 13.488, 13.492, 13.496, 13.499, 13.503, 13.507, 13.51, 13.514, 13.517, 13.521, 13.525, 13.528, 13.532, 13.536, 13.539, 13.543, 13.546, 13.55, 13.554, 13.557, 13.561, 13.564, 13.568, 13.572, 13.575, 13.579, 13.583, 13.586, 13.59, 13.593, 13.597, 13.601, 13.604, 13.608, 13.612, 13.615, 13.619, 13.622, 13.626, 13.63, 13.633, 13.637, 13.64, 13.644, 13.648, 13.651, 13.655, 13.659, 13.662, 13.666, 13.669, 13.673, 13.677, 13.68, 13.684, 13.688, 13.691, 13.695, 13.698, 13.702, 13.706, 13.709, 13.713, 13.716, 13.72, 13.724, 13.727, 13.731, 13.735, 13.738, 13.742, 13.745, 13.749, 13.753, 13.756, 13.76, 13.764, 13.767, 13.771, 13.774, 13.778, 13.782, 13.785, 13.789, 13.792, 13.796, 13.8, 13.803, 13.807, 13.811, 13.814, 13.818, 13.821, 13.825, 13.829, 13.832, 13.836, 13.84, 13.843, 13.847, 13.85, 13.854, 13.858, 13.861, 13.865, 13.868, 13.872, 13.876, 13.879, 13.883, 13.887, 13.89, 13.894, 13.897, 13.901, 13.905, 13.908, 13.912, 13.916, 13.919, 13.923, 13.926, 13.93, 13.934, 13.937, 13.941, 13.944, 13.948, 13.952, 13.955, 13.959, 13.963, 13.966, 13.97, 13.973, 13.977, 13.981, 13.984, 13.988, 13.992, 13.995, 13.999, 14.002, 14.006, 14.01, 14.013, 14.017, 14.02, 14.024, 14.028, 14.031, 14.035, 14.039, 14.042, 14.046, 14.049, 14.053, 14.057, 14.06, 14.064, 14.068, 14.071, 14.075, 14.078, 14.082, 14.086, 14.089, 14.093, 14.096, 14.1, 14.104, 14.107, 14.111, 14.115, 14.118, 14.122, 14.125, 14.129, 14.133, 14.136, 14.14, 14.144, 14.147, 14.151, 14.154, 14.158, 14.162, 14.165, 14.169, 14.172, 14.176, 14.18, 14.183, 14.187, 14.191, 14.194, 14.198, 14.201, 14.205, 14.209, 14.212, 14.216, 14.22, 14.223, 14.227, 14.23, 14.234, 14.238, 14.241, 14.245, 14.248, 14.252, 14.256, 14.259, 14.263, 14.267, 14.27, 14.274, 14.277, 14.281, 14.285, 14.288, 14.292, 14.296, 14.299, 14.303, 14.306, 14.31, 14.314, 14.317, 14.321, 14.324, 14.328, 14.332, 14.335, 14.339, 14.343, 14.346, 14.35, 14.353, 14.357, 14.361, 14.364, 14.368, 14.372, 14.375, 14.379, 14.382, 14.386, 14.39, 14.393, 14.397, 14.4, 14.404, 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14.864, 14.867, 14.871, 14.875, 14.878, 14.882, 14.885, 14.889, 14.893, 14.896, 14.9, 14.904, 14.907, 14.911, 14.914, 14.918, 14.922, 14.925, 14.929, 14.933, 14.936, 14.94, 14.943, 14.947, 14.951, 14.954, 14.958, 14.961, 14.965, 14.969, 14.972, 14.976, 14.98, 14.983, 14.987, 14.99, 14.994, 14.998, 15.001, 15.005, 15.009, 15.012, 15.016, 15.019, 15.023, 15.027, 15.03, 15.034, 15.037, 15.041, 15.045, 15.048, 15.052, 15.056, 15.059, 15.063, 15.066, 15.07, 15.074, 15.077, 15.081, 15.085, 15.088, 15.092, 15.095, 15.099, 15.103, 15.106, 15.11, 15.113, 15.117, 15.121, 15.124, 15.128, 15.132, 15.135, 15.139, 15.142, 15.146, 15.15, 15.153, 15.157, 15.161, 15.164, 15.168, 15.171, 15.175, 15.179, 15.182, 15.186, 15.189, 15.193, 15.197, 15.2, 15.204, 15.208, 15.211, 15.215, 15.218, 15.222, 15.226, 15.229, 15.233, 15.237, 15.24, 15.244, 15.247, 15.251, 15.255, 15.258, 15.262, 15.265, 15.269, 15.273, 15.276, 15.28, 15.284, 15.287, 15.291, 15.294, 15.298, 15.302, 15.305, 15.309, 15.313, 15.316, 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15.776, 15.779, 15.783, 15.787, 15.79, 15.794, 15.797, 15.801, 15.805, 15.808, 15.812, 15.816, 15.819, 15.823, 15.826, 15.83, 15.834, 15.837, 15.841, 15.845, 15.848, 15.852, 15.855, 15.859, 15.863, 15.866, 15.87, 15.873, 15.877, 15.881, 15.884, 15.888, 15.892, 15.895, 15.899, 15.902, 15.906, 15.91, 15.913, 15.917, 15.921, 15.924, 15.928, 15.931, 15.935, 15.939, 15.942, 15.946, 15.949, 15.953, 15.957, 15.96, 15.964, 15.968, 15.971, 15.975, 15.978, 15.982, 15.986, 15.989, 15.993, 15.997, 16, 16.004, 16.007, 16.011, 16.015, 16.018, 16.022, 16.025, 16.029, 16.033, 16.036, 16.04, 16.044, 16.047, 16.051, 16.054, 16.058, 16.062, 16.065, 16.069, 16.073, 16.076, 16.08, 16.083, 16.087, 16.091, 16.094, 16.098, 16.101, 16.105, 16.109, 16.112, 16.116, 16.12, 16.123, 16.127, 16.13, 16.134, 16.138, 16.141, 16.145, 16.149, 16.152, 16.156, 16.159, 16.163, 16.167, 16.17, 16.174, 16.177, 16.181, 16.185, 16.188, 16.192, 16.196, 16.199, 16.203, 16.206, 16.21, 16.214, 16.217, 16.221, 16.225, 16.228, 16.232, 16.235, 16.239, 16.243, 16.246, 16.25, 16.253, 16.257, 16.261, 16.264, 16.268, 16.272, 16.275, 16.279, 16.282, 16.286, 16.29, 16.293, 16.297, 16.301, 16.304, 16.308, 16.311, 16.315, 16.319, 16.322, 16.326, 16.329, 16.333, 16.337, 16.34, 16.344, 16.348, 16.351, 16.355, 16.358, 16.362, 16.366, 16.369, 16.373, 16.377, 16.38, 16.384, 16.387, 16.391, 16.395, 16.398, 16.402, 16.405, 16.409, 16.413, 16.416, 16.42, 16.424, 16.427, 16.431, 16.434, 16.438, 16.442, 16.445, 16.449, 16.453, 16.456, 16.46, 16.463, 16.467, 16.471, 16.474, 16.478, 16.481, 16.485, 16.489, 16.492, 16.496, 16.5, 16.503, 16.507, 16.51, 16.514, 16.518, 16.521, 16.525, 16.529, 16.532, 16.536, 16.539, 16.543, 16.547, 16.55, 16.554, 16.557, 16.561, 16.565, 16.568, 16.572, 16.576, 16.579, 16.583, 16.586, 16.59, 16.594, 16.597, 16.601, 16.605, 16.608, 16.612, 16.615, 16.619, 16.623, 16.626, 16.63, 16.633, 16.637, 16.641, 16.644, 16.648, 16.652, 16.655, 16.659, 16.662, 16.666, 16.67, 16.673, 16.677, 16.681, 16.684, 16.688, 16.691, 16.695, 16.699, 16.702, 16.706, 16.709, 16.713, 16.717, 16.72, 16.724, 16.728, 16.731, 16.735, 16.738, 16.742, 16.746, 16.749, 16.753, 16.757, 16.76, 16.764, 16.767, 16.771, 16.775, 16.778, 16.782, 16.785, 16.789, 16.793, 16.796, 16.8, 16.804, 16.807, 16.811, 16.814, 16.818, 16.822, 16.825, 16.829, 16.833, 16.836, 16.84, 16.843, 16.847, 16.851, 16.854, 16.858, 16.861, 16.865, 16.869, 16.872, 16.876, 16.88, 16.883, 16.887, 16.89, 16.894, 16.898, 16.901, 16.905, 16.909, 16.912, 16.916, 16.919, 16.923, 16.927, 16.93, 16.934, 16.937, 16.941, 16.945, 16.948, 16.952, 16.956, 16.959, 16.963, 16.966, 16.97, 16.974, 16.977, 16.981, 16.985, 16.988, 16.992, 16.995, 16.999, 17.003, 17.006, 17.01, 17.013, 17.017, 17.021, 17.024, 17.028, 17.032, 17.035, 17.039, 17.042, 17.046, 17.05, 17.053, 17.057, 17.061, 17.064, 17.068, 17.071, 17.075, 17.079, 17.082, 17.086, 17.089, 17.093, 17.097, 17.1, 17.104, 17.108, 17.111, 17.115, 17.118, 17.122, 17.126, 17.129, 17.133, 17.137, 17.14, 17.144, 17.147, 17.151, 17.155, 17.158, 17.162, 17.166, 17.169, 17.173, 17.176, 17.18, 17.184, 17.187, 17.191, 17.194, 17.198, 17.202, 17.205, 17.209, 17.213, 17.216, 17.22, 17.223, 17.227, 17.231, 17.234, 17.238, 17.242, 17.245, 17.249, 17.252, 17.256, 17.26, 17.263, 17.267, 17.27, 17.274, 17.278, 17.281, 17.285, 17.289, 17.292, 17.296, 17.299, 17.303, 17.307, 17.31, 17.314, 17.318, 17.321, 17.325, 17.328, 17.332, 17.336, 17.339, 17.343, 17.346, 17.35, 17.354, 17.357, 17.361, 17.365, 17.368, 17.372, 17.375, 17.379, 17.383, 17.386, 17.39, 17.394, 17.397, 17.401, 17.404, 17.408, 17.412, 17.415, 17.422, 17.426, 17.43, 17.433, 17.437, 17.441, 17.444, 17.448, 17.451, 17.455, 17.459, 17.462, 17.466, 17.47, 17.473, 17.477, 17.48, 17.484, 17.488, 17.491, 17.495, 17.498, 17.502, 17.506, 17.509, 17.513, 17.517, 17.52, 17.524, 17.527, 17.531, 17.535, 17.538, 17.542, 17.546, 17.549, 17.553, 17.556, 17.56, 17.564, 17.567, 17.571, 17.574, 17.578, 17.582, 17.585, 17.589, 17.593, 17.596, 17.6, 17.603, 17.607, 17.611, 17.614, 17.618, 17.622, 17.625, 17.629, 17.632, 17.636, 17.64, 17.643, 17.647, 17.65, 17.654, 17.658, 17.661, 17.665, 17.669, 17.672, 17.676, 17.679, 17.683, 17.687, 17.69, 17.694, 17.698, 17.701, 17.705, 17.708, 17.712, 17.716, 17.719, 17.723, 17.726, 17.73, 17.734, 17.737, 17.741, 17.745, 17.748, 17.752, 17.755, 17.759, 17.763, 17.766, 17.77, 17.774, 17.777, 17.781, 17.784, 17.788, 17.792, 17.795, 17.799, 17.802, 17.806, 17.81, 17.813, 17.817, 17.821, 17.824, 17.828, 17.831, 17.835, 17.839, 17.842, 17.846, 17.85, 17.853, 17.857, 17.86, 17.864, 17.868, 17.871, 17.875, 17.878, 17.882, 17.886, 17.889, 17.893, 17.897, 17.9, 17.904, 17.907, 17.911, 17.915, 17.918, 17.922, 17.926, 17.929, 17.933, 17.936, 17.94, 17.944, 17.947, 17.951, 17.954, 17.958, 17.962, 17.965, 17.969, 17.973, 17.976, 17.98, 17.983, 17.987, 17.991, 17.994, 17.998, 18.002, 18.005, 18.009, 18.012, 18.016, 18.02, 18.023, 18.027, 18.03, 18.034, 18.038, 18.041, 18.045, 18.049, 18.052, 18.056, 18.059, 18.063, 18.067, 18.07, 18.074, 18.078, 18.081, 18.085, 18.088, 18.092, 18.096, 18.099, 18.103, 18.106, 18.11, 18.114, 18.117, 18.121, 18.125, 18.128, 18.132, 18.135, 18.139, 18.143, 18.146, 18.15, 18.154, 18.157, 18.161, 18.164, 18.168, 18.172, 18.175, 18.179, 18.182, 18.186, 18.19, 18.193, 18.197, 18.201, 18.204, 18.208, 18.211, 18.215, 18.219, 18.222, 18.226, 18.23, 18.233, 18.237, 18.24, 18.244, 18.248, 18.251, 18.255, 18.258, 18.262, 18.266, 18.269, 18.273, 18.277, 18.28, 18.284, 18.287, 18.291, 18.295, 18.298, 18.302, 18.306, 18.309, 18.313, 18.316, 18.32, 18.324, 18.327, 18.331, 18.334, 18.338, 18.342, 18.345, 18.349, 18.353, 18.356, 18.36, 18.363, 18.367, 18.371, 18.374, 18.378, 18.382, 18.385, 18.389, 18.392, 18.396, 18.4, 18.403, 18.407, 18.41, 18.414, 18.418, 18.421, 18.425, 18.429, 18.432, 18.436, 18.439, 18.443, 18.447, 18.45, 18.454, 18.458, 18.461, 18.465, 18.468, 18.472, 18.476, 18.479, 18.483, 18.486, 18.49, 18.494, 18.497, 18.501, 18.505, 18.508, 18.512, 18.515, 18.519, 18.523, 18.526, 18.53, 18.534, 18.537, 18.541, 18.544, 18.548, 18.552, 18.555, 18.559, 18.562, 18.566, 18.57, 18.573, 18.577, 18.581, 18.584, 18.588, 18.591, 18.595, 18.599, 18.602, 18.606, 18.61, 18.613, 18.617, 18.62, 18.624, 18.628,

	18.631, 18.635, 18.638, 18.642, 18.646, 18.649, 18.653, 18.657, 18.66, 18.664, 18.667, 18.671, 18.675, 18.678, 18.682, 18.686, 18.689, 18.693, 18.696, 18.7, 18.704, 18.707, 18.711, 18.714, 18.718, 18.722, 18.725, 18.729, 18.733, 18.736, 18.74, 18.743, 18.747, 18.751}
Relative tolerance	1E-4

Absolute tolerance

Field	Method	Tolerance method	Tolerance factor	Derivative tolerance method	Time derivative factor	Tolerance	Tolerance for time derivatives
Displacement field (comp1.u)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Viscous energy dissipation (comp1.mbd.rbc1.Wv)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Frictional energy dissipation (comp1.mbd.rbc1.Wf)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Rigid body displacement (spatial frame) (comp1.mbd.rd1.u)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Rigid body rotation (comp1.mbd.rd1.phi)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Rigid body displacement (spatial frame) (comp1.mbd.rd2.u)	Use global	Factor	0.1	Automatic	1	0.001	0.001
Rigid body rotation (comp1.mbd.rd2.phi)	Use global	Factor	0.1	Automatic	1	0.001	0.001

Time stepping

Description	Value
Steps taken by solver	Strict
Maximum BDF order	3
Consistent initialization	Off

Results while solving

Description	Value
Plot	On
Plot group	Displacement (mbd)

Log
2212   4.4076   0.0023101 out 5900 5901 5900   3   41   27 1.3e-14 1.4e-14
2213   4.41   0.0023101 out 5901 5902 5901   3   41   27 4.5e-16 5.2e-15
2214   4.4123   0.0023101 out 5902 5903 5902   3   41   27 9.2e-16 3.7e-15
2215   4.4146   0.0023101 out 5903 5904 5903   3   41   27 8.1e-15 1.2e-14
2216   4.4169   0.0023101 out 5904 5905 5904   3   41   27 3.6e-15 1.1e-14
2217   4.4192   0.0023101 out 5905 5906 5905   3   41   27   2e-15 1.9e-15
2218   4.4215   0.0023101 out 5906 5907 5906   3   41   27 1.3e-15 4.5e-15
2219   4.4238   0.0023101 out 5907 5908 5907   3   41   27 1.6e-15 1.5e-14
2220   4.4261   0.0023101 out 5908 5909 5908   3   41   27 4.9e-15   1e-14
2221   4.4284   0.0023101 out 5909 5910 5909   3   41   27 3.9e-15 1.1e-14
2222   4.4307   0.0023101 out 5910 5911 5910   3   41   27 2.4e-15 2.8e-15
2223   4.4331   0.0023101 out 5911 5912 5911   3   41   27 2.9e-15 3.4e-15
2224   4.4354   0.0023101 out 5912 5913 5912   3   41   27 3.6e-15 7.1e-15
2225   4.4377   0.0023101 out 5913 5914 5913   3   41   27   2e-15 1.2e-14
2226   4.44   0.0023101 out 5914 5915 5914   3   41   27 2.4e-15 1.8e-14
2227   4.4423   0.0023101 out 5915 5916 5915   3   41   27 7.5e-15   8e-15
2228   4.4446   0.0023101 out 5916 5917 5916   3   41   27   8e-16 9.4e-16
2229   4.4469   0.0023101 out 5917 5918 5917   3   41   27 1.9e-16 1.5e-14
2230   4.4492   0.0023101 out 5918 5919 5918   3   41   27 4.3e-15 1.2e-14
2231   4.4515   0.0023101 out 5919 5920 5919   3   41   27   6e-15 6.6e-15
2232   4.4538   0.0023101 out 5920 5921 5920   3   41   27 2.4e-15 5.2e-15
2233   4.4562   0.0023101 out 5921 5922 5921   3   41   27 6.5e-16 9.8e-15
2234   4.4585   0.0023101 out 5922 5923 5922   3   41   27 4.7e-15 5.1e-15
2235   4.4608   0.0023101 out 5923 5924 5923   3   41   27 4.1e-16 1.3e-14
2236   4.4631   0.0023101 out 5924 5925 5924   3   41   27 1.2e-15 2.2e-15
2237   4.4654   0.0023101 out 5925 5926 5925   3   41   27 2.3e-15 2.3e-15
2238   4.4677   0.0023101 out 5926 5927 5926   3   41   27 2.5e-15 2.4e-15
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2335    4.6918   0.0023101 out 6023 6024 6023    3    41     27   3e-15  3.7e-15
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2441    4.9367   0.0023101 out 6129 6130 6129    3    41    27  1.2e-14  1.9e-14
2442    4.939    0.0023101 out 6130 6131 6130    3    41    27   7e-15   1.8e-14
2443    4.9413   0.0023101 out 6131 6132 6131    3    41    27  6.1e-15  2.2e-14
2444    4.9436   0.0023101 out 6132 6133 6132    3    41    27  1.9e-15  5.9e-15
2445    4.9459   0.0023101 out 6133 6134 6133    3    41    27  4.3e-15  4.2e-15
2446    4.9482   0.0023101 out 6134 6135 6134    3    41    27  1.1e-14  1.6e-14
2447    4.9505   0.0023101 out 6135 6136 6135    3    41    27  4.4e-15  8.6e-15
2448    4.9528   0.0023101 out 6136 6137 6136    3    41    27  1.2e-14  1.3e-14
2449    4.9551   0.0023101 out 6137 6138 6137    3    41    27  4.2e-15  5.4e-15
2450    4.9574   0.0023101 out 6138 6139 6138    3    41    27  3.3e-15  9.1e-15
2451    4.9598   0.0023101 out 6139 6140 6139    3    41    27  1.9e-17   4e-15
2452    4.9621   0.0023101 out 6140 6141 6140    3    41    27  8.6e-16  1.1e-14
2453    4.9644   0.0023101 out 6141 6142 6141    3    41    27  1.9e-14  1.8e-14
2454    4.9667   0.0023101 out 6142 6143 6142    3    41    27  1.2e-14  1.1e-14
2455    4.969    0.0023101 out 6143 6144 6143    3    41    27  8.2e-15  8.9e-15
2456    4.9713   0.0023101 out 6144 6145 6144    3    41    27  1.8e-15  2.2e-15
2457    4.9736   0.0023101 out 6145 6146 6145    3    41    27  7.1e-15  7.3e-15
2458    4.9759   0.0023101 out 6146 6147 6146    3    41    27  1.6e-15  2.6e-15
2459    4.9782   0.0023101 out 6147 6148 6147    3    41    27  1.2e-15  1.5e-15
2460    4.9805   0.0023101 out 6148 6149 6148    3    41    27  5.8e-16  8.6e-15
2461    4.9829   0.0023101 out 6149 6150 6149    3    41    27  1.4e-14  1.6e-14
2462    4.9852   0.0023101 out 6150 6151 6150    3    41    27  3.9e-15  4.6e-15
2463    4.9875   0.0023101 out 6151 6152 6151    3    41    27  2.2e-15   1e-14
2464    4.9898   0.0023101 out 6152 6153 6152    3    41    27  1.8e-15   1e-14
2465    4.9921   0.0023101 out 6153 6154 6153    3    41    27  4.8e-15  6.1e-15
2466    4.9944   0.0023101 out 6154 6155 6154    3    41    27   3e-15   3.9e-15
2467    4.9967   0.0023101 out 6155 6156 6155    3    41    27   2e-15   2.5e-15
2468    4.999    0.0023101 out 6156 6157 6156    3    41    27  7.8e-16  3.4e-15
2469    5.0013   0.0023101 out 6157 6158 6157    3    41    27   3e-15   2.9e-15
2470    5.0037   0.0023101 out 6158 6159 6158    3    41    27  1.2e-15  8.9e-15
2471    5.006    0.0023101 out 6159 6160 6159    3    41    27  2.1e-15  3.6e-15
2472    5.0083   0.0023101 out 6160 6161 6160    3    41    27  6.3e-15  8.6e-15
2473    5.0106   0.0023101 out 6161 6162 6161    3    41    27  9.8e-15  1.1e-14
2474    5.0129   0.0023101 out 6162 6163 6162    3    41    27  4.6e-16  1.8e-15
2475    5.0152   0.0023101 out 6163 6164 6163    3    41    27  4.1e-15   1e-14
2476    5.0175   0.0023101 out 6164 6165 6164    3    41    27  1.2e-14  1.2e-14
2477    5.0198   0.0023101 out 6165 6166 6165    3    41    27  3.2e-15  3.1e-15
2478    5.0221   0.0023101 out 6166 6167 6166    3    41    27  6.2e-16  7.2e-16
2479    5.0244   0.0023101 out 6167 6168 6167    3    41    27  3.7e-15  1.1e-14
2480    5.0268   0.0023101 out 6168 6169 6168    3    41    27  6.7e-15  7.4e-15
2481    5.0291   0.0023101 out 6169 6170 6169    3    41    27   3e-17   5.4e-15
2482    5.0314   0.0023101 out 6170 6171 6170    3    41    27   1e-15   6.3e-15
2483    5.0337   0.0023101 out 6171 6172 6171    3    41    27  4.1e-15  4.3e-15
2484    5.036    0.0023101 out 6172 6173 6172    3    41    27  9.3e-15  8.9e-15
2485    5.0383   0.0023101 out 6173 6174 6173    3    41    27  2.8e-15   8e-15
2486    5.0406   0.0023101 out 6174 6175 6174    3    41    27  4.8e-15  5.2e-15
2487    5.0429   0.0023101 out 6175 6176 6175    3    41    27  2.4e-16  5.2e-15
2488    5.0452   0.0023101 out 6176 6177 6176    3    41    27  1.4e-14  1.5e-14
2489    5.0475   0.0023101 out 6177 6178 6177    3    41    27  6.5e-16   3e-15
2490    5.0499   0.0023101 out 6178 6179 6178    3    41    27  5.6e-16  3.2e-15
2491    5.0522   0.0023101 out 6179 6180 6179    3    41    27  4.7e-15  7.6e-15
2492    5.0545   0.0023101 out 6180 6181 6180    3    41    27  2.5e-16  1.8e-14
2493    5.0568   0.0023101 out 6181 6182 6181    3    41    27  1.2e-14  1.1e-14
2494    5.0591   0.0023101 out 6182 6183 6182    3    41    27  3.9e-15   5e-15
2495    5.0614   0.0023101 out 6183 6184 6183    3    41    27   6e-15   8.6e-15
2496    5.0637   0.0023101 out 6184 6185 6184    3    41    27  2.8e-15  2.9e-15
2497    5.066    0.0023101 out 6185 6186 6185    3    41    27  4.6e-15  1.2e-14
2498    5.0683   0.0023101 out 6186 6187 6186    3    41    27  5.6e-15  1.2e-14
2499    5.0706   0.0023101 out 6187 6188 6187    3    41    27   2e-15   4e-15
2500    5.073    0.0023101 out 6188 6189 6188    3    41    27  4.8e-15  6.9e-15
2501    5.0753   0.0023101 out 6189 6190 6189    3    41    27   3e-15   2.8e-15
2502    5.0776   0.0023101 out 6190 6191 6190    3    41    27  6.7e-16  1.3e-15
2503    5.0799   0.0023101 out 6191 6192 6191    3    41    27  5.3e-15  6.1e-15
```

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2504    5.0822   0.0023101 out 6192 6193 6192    3    41    27  7.3e-15  1.8e-14
2505    5.0845   0.0023101 out 6193 6194 6193    3    41    27  8.9e-15  1.1e-14
2506    5.0868   0.0023101 out 6194 6195 6194    3    41    27    1e-14  1.3e-14
2507    5.0891   0.0023101 out 6195 6196 6195    3    41    27  1.1e-16    3e-15
2508    5.0914   0.0023101 out 6196 6197 6196    3    41    27  1.2e-15  2.2e-14
2509    5.0937   0.0023101 out 6197 6198 6197    3    41    27  6.7e-15  8.4e-15
2510    5.0961   0.0023101 out 6198 6199 6198    3    41    27  9.9e-15  1.1e-14
2511    5.0984   0.0023101 out 6199 6200 6199    3    41    27  5.7e-15  6.9e-15
2512    5.1007   0.0023101 out 6200 6201 6200    3    41    27  8.2e-16  2.8e-15
2513    5.103    0.0023101 out 6201 6202 6201    3    41    27  8.9e-15  1.4e-14
2514    5.1053   0.0023101 out 6202 6203 6202    3    41    27  5.4e-15  5.5e-15
2515    5.1076   0.0023101 out 6203 6204 6203    3    41    27  3.5e-15  5.6e-15
2516    5.1099   0.0023101 out 6204 6205 6204    3    41    27  2.8e-15    3e-15
2517    5.1122   0.0023101 out 6205 6206 6205    3    41    27  2.4e-15  1.2e-14
2518    5.1145   0.0023101 out 6206 6207 6206    3    41    27  7.4e-16  2.4e-15
2519    5.1168   0.0023101 out 6207 6208 6207    3    41    27  8.2e-15  1.1e-14
2520    5.1192   0.0023101 out 6208 6209 6208    3    41    27  1.9e-16  6.1e-16
2521    5.1215   0.0023101 out 6209 6210 6209    3    41    27  9.9e-15    1e-14
2522    5.1238   0.0023101 out 6210 6211 6210    3    41    27  1.5e-15  2.9e-15
2523    5.1261   0.0023101 out 6211 6212 6211    3    41    27  5.3e-15  6.7e-15
2524    5.1284   0.0023101 out 6212 6213 6212    3    41    27    1e-15    7e-15
2525    5.1307   0.0023101 out 6213 6214 6213    3    41    27  5.1e-15  5.2e-15
2526    5.133    0.0023101 out 6214 6215 6214    3    41    27  7.6e-15  1.2e-14
2527    5.1353   0.0023101 out 6215 6216 6215    3    41    27  1.3e-14  1.7e-14
2528    5.1376   0.0023101 out 6216 6217 6216    3    41    27  2.8e-15  1.2e-14
2529    5.1399   0.0023101 out 6217 6218 6217    3    41    27  1.3e-15  1.8e-14
2530    5.1423   0.0023101 out 6218 6219 6218    3    41    27  1.3e-14  1.6e-14
2531    5.1446   0.0023101 out 6219 6220 6219    3    41    27  4.8e-15  8.1e-15
2532    5.1469   0.0023101 out 6220 6221 6220    3    41    27  1.2e-14  1.7e-14
2533    5.1492   0.0023101 out 6221 6222 6221    3    41    27  3.5e-15  4.7e-15
2534    5.1515   0.0023101 out 6222 6223 6222    3    41    27  1.3e-14  1.6e-14
2535    5.1538   0.0023101 out 6223 6224 6223    3    41    27  1.4e-15  6.1e-15
2536    5.1561   0.0023101 out 6224 6225 6224    3    41    27  6.1e-15  1.1e-14
2537    5.1584   0.0023101 out 6225 6226 6225    3    41    27  4.5e-15  4.4e-15
2538    5.1607   0.0023101 out 6226 6227 6226    3    41    27    3e-16  3.1e-15
2539    5.163    0.0023101 out 6227 6228 6227    3    41    27  8.7e-15  1.9e-14
2540    5.1654   0.0023101 out 6228 6229 6228    3    41    27  1.7e-15  8.4e-15
2541    5.1677   0.0023101 out 6229 6230 6229    3    41    27  1.4e-14  1.4e-14
2542    5.17     0.0023101 out 6230 6231 6230    3    41    27  8.9e-15  8.6e-15
2543    5.1723   0.0023101 out 6231 6232 6231    3    41    27  4.5e-15    1e-14
2544    5.1746   0.0023101 out 6232 6233 6232    3    41    27  9.1e-15  1.8e-14
2545    5.1769   0.0023101 out 6233 6234 6233    3    41    27  3.5e-15    5e-15
2546    5.1792   0.0023101 out 6234 6235 6234    3    41    27  4.8e-15  6.6e-15
2547    5.1815   0.0023101 out 6235 6236 6235    3    41    27  1.1e-14  1.1e-14
2548    5.1838   0.0023101 out 6236 6237 6236    3    41    27  1.4e-15  1.5e-15
2549    5.1861   0.0023101 out 6237 6238 6237    3    41    27  1.7e-14  1.7e-14
2550    5.1885   0.0023101 out 6238 6239 6238    3    41    27  2.1e-16  1.1e-14
2551    5.1908   0.0023101 out 6239 6240 6239    3    41    27  9.6e-15    2e-14
2552    5.1931   0.0023101 out 6240 6241 6240    3    41    27  8.5e-15  1.4e-14
2553    5.1954   0.0023101 out 6241 6242 6241    3    41    27    9e-15  8.7e-15
2554    5.1977   0.0023101 out 6242 6243 6242    3    41    27  3.3e-15  3.6e-15
2555    5.2      0.0023101 out 6243 6244 6243    3    41    27  1.9e-15  3.9e-15
2556    5.2023   0.0023101 out 6244 6245 6244    3    41    27  1.6e-15  3.6e-14
2557    5.2046   0.0023101 out 6245 6246 6245    3    41    27  2.2e-15  5.9e-15
2558    5.2069   0.0023101 out 6246 6247 6246    3    41    27  8.7e-15  8.7e-15
2559    5.2092   0.0023101 out 6247 6248 6247    3    41    27  1.4e-14  1.5e-14
2560    5.2116   0.0023101 out 6248 6249 6248    3    41    27    4e-15  1.6e-14
2561    5.2139   0.0023101 out 6249 6250 6249    3    41    27  9.4e-16  9.2e-16
```
Time-stepping completed.
Solution time: 334 s. (5 minutes, 34 seconds)
Physical memory: 1.4 GB
Virtual memory: 1.64 GB
Ended at Mar 7, 2023, 10:41:28 AM.
----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

Advanced (aDef)

Assembly settings

Description	Value
Reuse sparsity pattern	On

Fully Coupled 1 (fc1)

General

Description	Value
Linear solver	Direct

Method and termination

Description	Value
Jacobian update	On every iteration

Maximum number of iterations	50

3.3.2. Parametric Solutions 1

v0=0.1 (su1)

General

Description	Value
Solution	v0=0.1 (sol3)

Log

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```
4842     17.488  0.0036191 out 5130 5131 5130    3    0     0 1.9e-15  1.3e-16
4843     17.491  0.0036191 out 5131 5132 5131    3    0     0  1e-14   2.6e-15
4844     17.495  0.0036191 out 5132 5133 5132    3    0     0 2.3e-14  2.3e-14
4845     17.498  0.0036191 out 5133 5134 5133    3    0     0 1.1e-14  1.1e-14
4846     17.502  0.0036191 out 5134 5135 5134    3    0     0  6e-15   1.6e-14
4847     17.506  0.0036191 out 5135 5136 5135    3    0     0 1.2e-14  1.1e-14
4848     17.509  0.0036191 out 5136 5137 5136    3    0     0 4.6e-16   9e-15
4849     17.513  0.0036191 out 5137 5138 5137    3    0     0 1.5e-14  1.5e-14
4850     17.517  0.0036191 out 5138 5139 5138    3    0     0  2e-14    2e-14
4851      17.52  0.0036191 out 5139 5140 5139    3    0     0 1.4e-14  1.5e-14
4852     17.524  0.0036191 out 5140 5141 5140    3    0     0 3.5e-15  5.5e-15
4853     17.527  0.0036191 out 5141 5142 5141    3    0     0 1.9e-15  1.8e-14
4854     17.531  0.0036191 out 5142 5143 5142    3    0     0 1.8e-15  1.3e-14
4855     17.535  0.0036191 out 5143 5144 5143    3    0     0 2.3e-15  2.8e-14
4856     17.538  0.0036191 out 5144 5145 5144    3    0     0 9.2e-15  1.3e-14
4857     17.542  0.0036191 out 5145 5146 5145    3    0     0 1.7e-14  1.8e-14
4858     17.546  0.0036191 out 5146 5147 5146    3    0     0  4e-16   3.3e-15
4859     17.549  0.0036191 out 5147 5148 5147    3    0     0 6.3e-16  1.4e-14
4860     17.553  0.0036191 out 5148 5149 5148    3    0     0 3.9e-15  1.1e-14
4861     17.556  0.0036191 out 5149 5150 5149    3    0     0 1.4e-14  2.2e-14
4862      17.56  0.0036191 out 5150 5151 5150    3    0     0 6.2e-15  1.3e-14
4863     17.564  0.0036191 out 5151 5152 5151    3    0     0 1.6e-14  2.4e-14
4864     17.567  0.0036191 out 5152 5153 5152    3    0     0 2.2e-15  3.1e-15
4865     17.571  0.0036191 out 5153 5154 5153    3    0     0 3.4e-15  3.5e-15
4866     17.574  0.0036191 out 5154 5155 5154    3    0     0 4.4e-15  2.9e-14
4867     17.578  0.0036191 out 5155 5156 5155    3    0     0 2.8e-14  3.7e-14
4868     17.582  0.0036191 out 5156 5157 5156    3    0     0 1.5e-14  1.5e-14
4869     17.585  0.0036191 out 5157 5158 5157    3    0     0 2.2e-14  2.2e-14
4870     17.589  0.0036191 out 5158 5159 5158    3    0     0 1.2e-14  1.2e-14
4871     17.593  0.0036191 out 5159 5160 5159    3    0     0 6.7e-15  1.6e-14
4872     17.596  0.0036191 out 5160 5161 5160    3    0     0 8.3e-15  8.7e-15
4873       17.6  0.0036191 out 5161 5162 5161    3    0     0 1.6e-14  2.4e-14
4874     17.603  0.0036191 out 5162 5163 5162    3    0     0 6.4e-15   1e-14
4875     17.607  0.0036191 out 5163 5164 5163    3    0     0 1.1e-14  1.1e-14
4876     17.611  0.0036191 out 5164 5165 5164    3    0     0 6.2e-15  8.8e-15
4877     17.614  0.0036191 out 5165 5166 5165    3    0     0 9.8e-16  2.7e-15
4878     17.618  0.0036191 out 5166 5167 5166    3    0     0 8.9e-15   1e-14
4879     17.622  0.0036191 out 5167 5168 5167    3    0     0 8.5e-16  2.3e-14
4880     17.625  0.0036191 out 5168 5169 5168    3    0     0 2.1e-17  6.2e-15
4881     17.629  0.0036191 out 5169 5170 5169    3    0     0  3e-16   2.5e-14
4882     17.632  0.0036191 out 5170 5171 5170    3    0     0 1.8e-14  2.6e-14
4883     17.636  0.0036191 out 5171 5172 5171    3    0     0 1.4e-14  1.8e-14
4884      17.64  0.0036191 out 5172 5173 5172    3    0     0 7.9e-15  8.3e-15
4885     17.643  0.0036191 out 5173 5174 5173    3    0     0 2.6e-16  1.2e-14
4886     17.647  0.0036191 out 5174 5175 5174    3    0     0 4.7e-16  1.7e-14
4887      17.65  0.0036191 out 5175 5176 5175    3    0     0  6e-15   8.4e-15
4888     17.654  0.0036191 out 5176 5177 5176    3    0     0 8.9e-16  1.4e-14
4889     17.658  0.0036191 out 5177 5178 5177    3    0     0 6.2e-15  9.1e-15
4890     17.661  0.0036191 out 5178 5179 5178    3    0     0 1.8e-15  4.8e-14
4891     17.665  0.0036191 out 5179 5180 5179    3    0     0 4.7e-15  4.7e-15
4892     17.669  0.0036191 out 5180 5181 5180    3    0     0 2.7e-15  2.9e-15
4893     17.672  0.0036191 out 5181 5182 5181    3    0     0 6.5e-15  1.5e-14
4894     17.676  0.0036191 out 5182 5183 5182    3    0     0 2.8e-15   5e-15
4895     17.679  0.0036191 out 5183 5184 5183    3    0     0 4.7e-15  1.3e-14
4896     17.683  0.0036191 out 5184 5185 5184    3    0     0 1.7e-14   2e-14
4897     17.687  0.0036191 out 5185 5186 5185    3    0     0 1.7e-15  1.5e-14
4898      17.69  0.0036191 out 5186 5187 5186    3    0     0 2.2e-15  1.6e-14
4899     17.694  0.0036191 out 5187 5188 5187    3    0     0 2.2e-14  2.2e-14
4900     17.698  0.0036191 out 5188 5189 5188    3    0     0 5.6e-15  1.1e-14
4901     17.701  0.0036191 out 5189 5190 5189    3    0     0 1.3e-14  1.7e-14
4902     17.705  0.0036191 out 5190 5191 5190    3    0     0  4e-15   3.1e-14
4903     17.708  0.0036191 out 5191 5192 5191    3    0     0 1.2e-14  1.6e-14
4904     17.712  0.0036191 out 5192 5193 5192    3    0     0 5.1e-15   1e-14
4905     17.716  0.0036191 out 5193 5194 5193    3    0     0 1.2e-14  3.9e-14
4906     17.719  0.0036191 out 5194 5195 5194    3    0     0 2.4e-14  2.6e-14
4907     17.723  0.0036191 out 5195 5196 5195    3    0     0 1.1e-14  2.8e-14
4908     17.726  0.0036191 out 5196 5197 5196    3    0     0 2.9e-15  3.7e-15
4909      17.73  0.0036191 out 5197 5198 5197    3    0     0 6.8e-16  1.5e-14
4910     17.734  0.0036191 out 5198 5199 5198    3    0     0 9.9e-15  3.3e-14
4911     17.737  0.0036191 out 5199 5200 5199    3    0     0 8.5e-15  1.8e-14
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4912	17.741	0.0036191	out	5200 5201 5200	3	0	0	2.6e-14	2.7e-14
4913	17.745	0.0036191	out	5201 5202 5201	3	0	0	2.9e-15	1.3e-14
4914	17.748	0.0036191	out	5202 5203 5202	3	0	0	8.4e-15	2.5e-14
4915	17.752	0.0036191	out	5203 5204 5203	3	0	0	9.6e-15	2.9e-14
4916	17.755	0.0036191	out	5204 5205 5204	3	0	0	3.8e-15	2.1e-14
4917	17.759	0.0036191	out	5205 5206 5205	3	0	0	1e-15	8.2e-15
4918	17.763	0.0036191	out	5206 5207 5206	3	0	0	9e-15	1.8e-14
4919	17.766	0.0036191	out	5207 5208 5207	3	0	0	1.8e-14	1.8e-14
4920	17.77	0.0036191	out	5208 5209 5208	3	0	0	1.4e-14	1.4e-14
4921	17.774	0.0036191	out	5209 5210 5209	3	0	0	1.6e-14	2e-14
4922	17.777	0.0036191	out	5210 5211 5210	3	0	0	2.3e-14	2.5e-14
4923	17.781	0.0036191	out	5211 5212 5211	3	0	0	4.2e-15	4.9e-15
4924	17.784	0.0036191	out	5212 5213 5212	3	0	0	6.6e-15	1.5e-14
4925	17.788	0.0036191	out	5213 5214 5213	3	0	0	5.8e-15	6e-15
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4927	17.795	0.0036191	out	5215 5216 5215	3	0	0	4.7e-15	3.4e-14
4928	17.799	0.0036191	out	5216 5217 5216	3	0	0	2.9e-15	1.5e-14
4929	17.802	0.0036191	out	5217 5218 5217	3	0	0	1.5e-14	1.6e-14
4930	17.806	0.0036191	out	5218 5219 5218	3	0	0	1.6e-14	1.9e-14
4931	17.81	0.0036191	out	5219 5220 5219	3	0	0	1.1e-14	1.1e-14
4932	17.813	0.0036191	out	5220 5221 5220	3	0	0	8.5e-15	1.3e-14
4933	17.817	0.0036191	out	5221 5222 5221	3	0	0	9.1e-15	9.6e-15
4934	17.821	0.0036191	out	5222 5223 5222	3	0	0	2.4e-14	2.4e-14
4935	17.824	0.0036191	out	5223 5224 5223	3	0	0	1.7e-15	2.3e-15
4936	17.828	0.0036191	out	5224 5225 5224	3	0	0	4.6e-15	7.1e-15
4937	17.831	0.0036191	out	5225 5226 5225	3	0	0	1.5e-14	1.9e-14
4938	17.835	0.0036191	out	5226 5227 5226	3	0	0	2.4e-15	5.5e-15
4939	17.839	0.0036191	out	5227 5228 5227	3	0	0	7.3e-16	3.9e-15
4940	17.842	0.0036191	out	5228 5229 5228	3	0	0	2.1e-14	2.2e-14
4941	17.846	0.0036191	out	5229 5230 5229	3	0	0	7.3e-15	8.6e-15
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4950	17.878	0.0036191	out	5238 5239 5238	3	0	0	1.4e-14	1.5e-14
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4984	18.002	0.0036191	out	5272 5273 5272	3	0	0	1.1e-14	1.2e-14
4985	18.005	0.0036191	out	5273 5274 5273	3	0	0	3e-15	4.1e-15
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4992	18.03	0.0036191	out	5280 5281 5280	3	0	0	1.3e-14	3e-14
4993	18.034	0.0036191	out	5281 5282 5281	3	0	0	6.8e-16	2e-15

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5011   18.099   0.0036191 out 5299 5300 5299   3   0   0 1.1e-15 1.6e-15
5012   18.103   0.0036191 out 5300 5301 5300   3   0   0 7.1e-15 1.2e-14
5013   18.106   0.0036191 out 5301 5302 5301   3   0   0 4.1e-15 1.4e-14
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5123    18.505   0.0036191 out 5411 5412 5411    3    0    0 5.5e-17   2e-14
5124    18.508   0.0036191 out 5412 5413 5412    3    0    0  1e-14   1.5e-14
5125    18.512   0.0036191 out 5413 5414 5413    3    0    0 2.3e-14  2.7e-14
5126    18.515   0.0036191 out 5414 5415 5414    3    0    0 2.5e-14  3.4e-14
5127    18.519   0.0036191 out 5415 5416 5415    3    0    0 1.3e-14  1.8e-14
5128    18.523   0.0036191 out 5416 5417 5416    3    0    0 1.1e-14  1.5e-14
5129    18.526   0.0036191 out 5417 5418 5417    3    0    0  3e-14   3.8e-14
5130     18.53   0.0036191 out 5418 5419 5418    3    0    0 4.7e-15  1.7e-14
5131    18.534   0.0036191 out 5419 5420 5419    3    0    0 1.7e-15  1.3e-14
5132    18.537   0.0036191 out 5420 5421 5420    3    0    0 2.3e-15  1.1e-14
5133    18.541   0.0036191 out 5421 5422 5421    3    0    0 7.3e-15  7.5e-15
5134    18.544   0.0036191 out 5422 5423 5422    3    0    0 3.7e-15  9.3e-15
5135    18.548   0.0036191 out 5423 5424 5423    3    0    0 5.9e-15   1e-14
5136    18.552   0.0036191 out 5424 5425 5424    3    0    0 4.9e-15  1.1e-14
5137    18.555   0.0036191 out 5425 5426 5425    3    0    0 2.6e-14  2.9e-14
5138    18.559   0.0036191 out 5426 5427 5426    3    0    0 6.7e-16  6.3e-15
5139    18.562   0.0036191 out 5427 5428 5427    3    0    0 9.5e-15  1.3e-14
5140    18.566   0.0036191 out 5428 5429 5428    3    0    0 2.7e-15  1.6e-14
5141     18.57   0.0036191 out 5429 5430 5429    3    0    0 3.2e-15   2e-14
5142    18.573   0.0036191 out 5430 5431 5430    3    0    0  3e-15   6.1e-15
5143    18.577   0.0036191 out 5431 5432 5431    3    0    0 1.9e-14  1.9e-14
5144    18.581   0.0036191 out 5432 5433 5432    3    0    0 9.9e-15  1.1e-14
5145    18.584   0.0036191 out 5433 5434 5433    3    0    0 2.9e-15   6e-15
5146    18.588   0.0036191 out 5434 5435 5434    3    0    0 9.6e-15  1.3e-14
5147    18.591   0.0036191 out 5435 5436 5435    3    0    0 7.2e-15  1.2e-14
5148    18.595   0.0036191 out 5436 5437 5436    3    0    0 1.5e-14   2e-14
5149    18.599   0.0036191 out 5437 5438 5437    3    0    0  6e-15   1.4e-14
5150    18.602   0.0036191 out 5438 5439 5438    3    0    0 4.9e-15   4e-14
5151    18.606   0.0036191 out 5439 5440 5439    3    0    0 8.3e-15  1.7e-14
5152     18.61   0.0036191 out 5440 5441 5440    3    0    0 8.4e-15   9e-15
5153    18.613   0.0036191 out 5441 5442 5441    3    0    0 8.7e-15  1.5e-14
5154    18.617   0.0036191 out 5442 5443 5442    3    0    0 7.2e-15  1.5e-14
5155     18.62   0.0036191 out 5443 5444 5443    3    0    0 2.4e-15  5.4e-15
5156    18.624   0.0036191 out 5444 5445 5444    3    0    0 1.9e-14   2e-14
5157    18.628   0.0036191 out 5445 5446 5445    3    0    0 1.4e-14  1.4e-14
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5158    18.631   0.0036191 out 5446 5447 5446     3     0     0  2.4e-14  2.8e-14
5159    18.635   0.0036191 out 5447 5448 5447     3     0     0  1.2e-15  2.1e-14
5160    18.638   0.0036191 out 5448 5449 5448     3     0     0  5.5e-15  7.8e-15
5161    18.642   0.0036191 out 5449 5450 5449     3     0     0  9.3e-15  1.3e-14
5162    18.646   0.0036191 out 5450 5451 5450     3     0     0  3.4e-15  6.8e-15
5163    18.649   0.0036191 out 5451 5452 5451     3     0     0  8.6e-15  5.4e-14
5164    18.653   0.0036191 out 5452 5453 5452     3     0     0  2.1e-14  2.2e-14
5165    18.657   0.0036191 out 5453 5454 5453     3     0     0  1.4e-14  3.4e-14
5166    18.66    0.0036191 out 5454 5455 5454     3     0     0  2.6e-15  1.1e-14
5167    18.664   0.0036191 out 5455 5456 5455     3     0     0  9.2e-15  4.5e-14
5168    18.667   0.0036191 out 5456 5457 5456     3     0     0  5.5e-15  1.7e-14
5169    18.671   0.0036191 out 5457 5458 5457     3     0     0  2.7e-15  1.5e-14
5170    18.675   0.0036191 out 5458 5459 5458     3     0     0  1.9e-14  1.9e-14
5171    18.678   0.0036191 out 5459 5460 5459     3     0     0  7.1e-15  2.7e-14
5172    18.682   0.0036191 out 5460 5461 5460     3     0     0  2.6e-14  2.8e-14
5173    18.686   0.0036191 out 5461 5462 5461     3     0     0  2.6e-15  3.4e-14
5174    18.689   0.0036191 out 5462 5463 5462     3     0     0  8.7e-15  9.5e-15
5175    18.693   0.0036191 out 5463 5464 5463     3     0     0  1.5e-15  1.1e-14
5176    18.696   0.0036191 out 5464 5465 5464     3     0     0  1.6e-14   2e-14
5177    18.7     0.0036191 out 5465 5466 5465     3     0     0   1e-15   6.8e-15
5178    18.704   0.0036191 out 5466 5467 5466     3     0     0  1.3e-14  1.3e-14
5179    18.707   0.0036191 out 5467 5468 5467     3     0     0  2.4e-16  2.8e-15
5180    18.711   0.0036191 out 5468 5469 5468     3     0     0  1.5e-14  2.8e-14
5181    18.714   0.0036191 out 5469 5470 5469     3     0     0  1.3e-14  1.5e-14
5182    18.718   0.0036191 out 5470 5471 5470     3     0     0  1.7e-14   2e-14
5183    18.722   0.0036191 out 5471 5472 5471     3     0     0  1.3e-15  1.7e-14
5184    18.725   0.0036191 out 5472 5473 5472     3     0     0  1.2e-14  2.1e-14
5185    18.729   0.0036191 out 5473 5474 5473     3     0     0  2.4e-14  3.8e-14
5186    18.733   0.0036191 out 5474 5475 5474     3     0     0  8.9e-15  9.3e-15
5187    18.736   0.0036191 out 5475 5476 5475     3     0     0  1.2e-14  2.2e-14
5188    18.74    0.0036191 out 5476 5477 5476     3     0     0  1.2e-15  1.3e-14
5189    18.743   0.0036191 out 5477 5478 5477     3     0     0  7.9e-15  1.2e-14
5190    18.747   0.0036191 out 5478 5479 5478     3     0     0  1.3e-15  1.1e-14
5191    18.751   0.0036191 out 5479 5480 5479     3     0     0  1.2e-14  2.4e-14
```
Time-stepping completed.
Solution time: 368 s. (6 minutes, 8 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

v0=1 (su2)

General

Description	Value
Solution	v0=1 (sol4)

Log
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```
4004    13.663   0.0034234 out 4540 4541 4540     3     0     0  3.1e-15  1.2e-14
4005    13.666   0.0034234 out 4541 4542 4541     3     0     0  6.1e-15   1e-14
4006    13.669   0.0034234 out 4542 4543 4542     3     0     0  6.4e-17  1.5e-14
4007    13.673   0.0034234 out 4543 4544 4543     3     0     0  8.7e-15  1.3e-14
4008    13.676   0.0034234 out 4544 4545 4544     3     0     0  1.3e-14  1.6e-14
4009    13.68    0.0034234 out 4545 4546 4545     3     0     0  7.6e-15  7.7e-15
4010    13.683   0.0034234 out 4546 4547 4546     3     0     0   5e-15   6e-15
4011    13.687   0.0034234 out 4547 4548 4547     3     0     0  3.5e-15  1.1e-14
4012    13.69    0.0034234 out 4548 4549 4548     3     0     0  2.5e-15   8e-15
4013    13.693   0.0034234 out 4549 4550 4549     3     0     0  1.6e-14  1.7e-14
4014    13.697   0.0034234 out 4550 4551 4550     3     0     0  7.9e-15  8.2e-15
4015    13.7     0.0034234 out 4551 4552 4551     3     0     0  8.7e-15   9e-15
4016    13.704   0.0034234 out 4552 4553 4552     3     0     0  2.2e-16   2e-14
4017    13.707   0.0034234 out 4553 4554 4553     3     0     0  1.2e-15  3.5e-15
4018    13.711   0.0034234 out 4554 4555 4554     3     0     0  3.5e-15   1e-14
4019    13.714   0.0034234 out 4555 4556 4555     3     0     0  9.1e-15  1.4e-14
4020    13.717   0.0034234 out 4556 4557 4556     3     0     0  1.6e-14  1.6e-14
4021    13.721   0.0034234 out 4557 4558 4557     3     0     0  3.2e-15  3.2e-15
4022    13.724   0.0034234 out 4558 4559 4558     3     0     0   2e-15   1.3e-14
4023    13.728   0.0034234 out 4559 4560 4559     3     0     0  2.9e-15   6e-15
4024    13.731   0.0034234 out 4560 4561 4560     3     0     0  3.9e-15  1.3e-14
4025    13.735   0.0034234 out 4561 4562 4561     3     0     0  4.2e-15  1.4e-14
4026    13.738   0.0034234 out 4562 4563 4562     3     0     0  1.1e-14  1.1e-14
4027    13.741   0.0034234 out 4563 4564 4563     3     0     0  1.5e-14  1.5e-14
4028    13.745   0.0034234 out 4564 4565 4564     3     0     0  1.8e-15   2e-15
4029    13.748   0.0034234 out 4565 4566 4565     3     0     0  1.1e-15   2e-14
4030    13.752   0.0034234 out 4566 4567 4566     3     0     0  4.8e-15  5.1e-15
4031    13.755   0.0034234 out 4567 4568 4567     3     0     0   5e-16   7.7e-15
4032    13.758   0.0034234 out 4568 4569 4568     3     0     0  8.3e-15  1.1e-14
4033    13.762   0.0034234 out 4569 4570 4569     3     0     0  2.1e-14  2.1e-14
4034    13.765   0.0034234 out 4570 4571 4570     3     0     0  4.5e-15  7.4e-15
4035    13.769   0.0034234 out 4571 4572 4571     3     0     0  1.2e-14  2.5e-14
4036    13.772   0.0034234 out 4572 4573 4572     3     0     0  4.7e-15  1.4e-14
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4037   13.776  0.0034234 out 4573 4574 4573   3   0   0 5.2e-16 1.2e-14
4038   13.779  0.0034234 out 4574 4575 4574   3   0   0 1.6e-14 1.7e-14
4039   13.782  0.0034234 out 4575 4576 4575   3   0   0 8.1e-15 2.6e-14
4040   13.786  0.0034234 out 4576 4577 4576   3   0   0 8.6e-15 1.4e-14
4041   13.789  0.0034234 out 4577 4578 4577   3   0   0 1.5e-14 1.8e-14
4042   13.793  0.0034234 out 4578 4579 4578   3   0   0 1.9e-14 2.1e-14
4043   13.796  0.0034234 out 4579 4580 4579   3   0   0 5e-15  1e-14
4044    13.8   0.0034234 out 4580 4581 4580   3   0   0 1.1e-14 1.9e-14
4045   13.803  0.0034234 out 4581 4582 4581   3   0   0 9.4e-15 1.4e-14
4046   13.806  0.0034234 out 4582 4583 4582   3   0   0 1.2e-15 2.1e-15
4047   13.81   0.0034234 out 4583 4584 4583   3   0   0 7.6e-15 7.9e-15
4048   13.813  0.0034234 out 4584 4585 4584   3   0   0 1.1e-14 1.1e-14
4049   13.817  0.0034234 out 4585 4586 4585   3   0   0 9.9e-15 1.6e-14
4050   13.82   0.0034234 out 4586 4587 4586   3   0   0 2.4e-15 1.7e-14
4051   13.824  0.0034234 out 4587 4588 4587   3   0   0 8.7e-15 2.1e-14
4052   13.827  0.0034234 out 4588 4589 4588   3   0   0 8.1e-15 9.5e-15
4053   13.83   0.0034234 out 4589 4590 4589   3   0   0 8.4e-16 3.6e-15
4054   13.834  0.0034234 out 4590 4591 4590   3   0   0 2.9e-15 1.5e-14
4055   13.837  0.0034234 out 4591 4592 4591   3   0   0 3.9e-15 4.2e-15
4056   13.841  0.0034234 out 4592 4593 4592   3   0   0 1.4e-14 1.5e-14
4057   13.844  0.0034234 out 4593 4594 4593   3   0   0 6.6e-16 1.7e-14
4058   13.848  0.0034234 out 4594 4595 4594   3   0   0 6.9e-15 1.8e-14
4059   13.851  0.0034234 out 4595 4596 4595   3   0   0 9.8e-16  2e-14
4060   13.854  0.0034234 out 4596 4597 4596   3   0   0 1.7e-15 1.9e-15
4061   13.858  0.0034234 out 4597 4598 4597   3   0   0 1.2e-14 1.7e-14
4062   13.861  0.0034234 out 4598 4599 4598   3   0   0 6.7e-15 2.9e-14
4063   13.865  0.0034234 out 4599 4600 4599   3   0   0  6e-15 9.2e-15
4064   13.868  0.0034234 out 4600 4601 4600   3   0   0 4.3e-15 7.4e-15
4065   13.871  0.0034234 out 4601 4602 4601   3   0   0 1.5e-14 1.6e-14
4066   13.875  0.0034234 out 4602 4603 4602   3   0   0  6e-15 6.9e-15
4067   13.878  0.0034234 out 4603 4604 4603   3   0   0 1.4e-15 7.7e-15
4068   13.882  0.0034234 out 4604 4605 4604   3   0   0 1.6e-14 1.7e-14
4069   13.885  0.0034234 out 4605 4606 4605   3   0   0 6.8e-15 6.8e-15
4070   13.889  0.0034234 out 4606 4607 4606   3   0   0 2.6e-15 2.2e-14
4071   13.892  0.0034234 out 4607 4608 4607   3   0   0 1.9e-15 4.9e-15
4072   13.895  0.0034234 out 4608 4609 4608   3   0   0  1e-14  1e-14
4073   13.899  0.0034234 out 4609 4610 4609   3   0   0 1.6e-15 7.8e-15
4074   13.902  0.0034234 out 4610 4611 4610   3   0   0 2.9e-15 1.7e-14
4075   13.906  0.0034234 out 4611 4612 4611   3   0   0 4.4e-15 9.1e-15
4076   13.909  0.0034234 out 4612 4613 4612   3   0   0 9.9e-15 1.2e-14
4077   13.913  0.0034234 out 4613 4614 4613   3   0   0 3.8e-15 4.1e-15
4078   13.916  0.0034234 out 4614 4615 4614   3   0   0 4.2e-15 1.4e-14
4079   13.919  0.0034234 out 4615 4616 4615   3   0   0 3.6e-15 1.5e-14
4080   13.923  0.0034234 out 4616 4617 4616   3   0   0 4.5e-16 5.9e-15
4081   13.926  0.0034234 out 4617 4618 4617   3   0   0 8.3e-15 9.8e-15
4082   13.93   0.0034234 out 4618 4619 4618   3   0   0 9.3e-15 9.5e-15
4083   13.933  0.0034234 out 4619 4620 4619   3   0   0 4.5e-15 4.9e-15
4084   13.937  0.0034234 out 4620 4621 4620   3   0   0 8.9e-16 8.7e-15
4085   13.94   0.0034234 out 4621 4622 4621   3   0   0 3.5e-15 7.6e-15
4086   13.943  0.0034234 out 4622 4623 4622   3   0   0 1.1e-15 3.3e-15
4087   13.947  0.0034234 out 4623 4624 4623   3   0   0 3.6e-15 1.1e-14
4088   13.95   0.0034234 out 4624 4625 4624   3   0   0 1.3e-15  5e-15
4089   13.954  0.0034234 out 4625 4626 4625   3   0   0 2.2e-15 1.7e-14
4090   13.957  0.0034234 out 4626 4627 4626   3   0   0 5.7e-16 1.4e-14
4091   13.96   0.0034234 out 4627 4628 4627   3   0   0 5.2e-15 6.9e-15
4092   13.964  0.0034234 out 4628 4629 4628   3   0   0 1.1e-14 1.2e-14
4093   13.967  0.0034234 out 4629 4630 4629   3   0   0 2.6e-15 3.3e-15
4094   13.971  0.0034234 out 4630 4631 4630   3   0   0 2.4e-15 6.1e-15
4095   13.974  0.0034234 out 4631 4632 4631   3   0   0 1.7e-15 3.2e-15
4096   13.978  0.0034234 out 4632 4633 4632   3   0   0 2.6e-15 3.8e-15
4097   13.981  0.0034234 out 4633 4634 4633   3   0   0 1.9e-15 3.5e-15
4098   13.984  0.0034234 out 4634 4635 4634   3   0   0 5.7e-15 1.7e-14
4099   13.988  0.0034234 out 4635 4636 4635   3   0   0  5e-15 2.4e-14
4100   13.991  0.0034234 out 4636 4637 4636   3   0   0  9e-15  1e-14
4101   13.995  0.0034234 out 4637 4638 4637   3   0   0  6e-15 1.2e-14
4102   13.998  0.0034234 out 4638 4639 4638   3   0   0 5.7e-15 1.3e-14
4103   14.002  0.0034234 out 4639 4640 4639   3   0   0 1.6e-15 3.3e-15
4104   14.005  0.0034234 out 4640 4641 4640   3   0   0 1.8e-15 6.5e-15
4105   14.008  0.0034234 out 4641 4642 4641   3   0   0 8.4e-15  2e-14
4106   14.012  0.0034234 out 4642 4643 4642   3   0   0 4.1e-15 2.4e-14
4107   14.015  0.0034234 out 4643 4644 4643   3   0   0 8.7e-15 1.1e-14
4108   14.019  0.0034234 out 4644 4645 4644   3   0   0 1.1e-14 1.1e-14
4109   14.022  0.0034234 out 4645 4646 4645   3   0   0 3.1e-15 5.5e-15
4110   14.026  0.0034234 out 4646 4647 4646   3   0   0 8.8e-16  1e-14
4111   14.029  0.0034234 out 4647 4648 4647   3   0   0 1.6e-14 1.6e-14
4112   14.032  0.0034234 out 4648 4649 4648   3   0   0 3.5e-15  1e-14
4113   14.036  0.0034234 out 4649 4650 4649   3   0   0 3.4e-15 2.4e-14
4114   14.039  0.0034234 out 4650 4651 4650   3   0   0  1e-15 7.3e-15
4115   14.043  0.0034234 out 4651 4652 4651   3   0   0 4.6e-15 1.8e-14
4116   14.046  0.0034234 out 4652 4653 4652   3   0   0 1.3e-14 1.8e-14
4117   14.049  0.0034234 out 4653 4654 4653   3   0   0  3e-15  3e-15
4118   14.053  0.0034234 out 4654 4655 4654   3   0   0 1.6e-14 1.8e-14
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4119   14.056   0.0034234 out 4655 4656 4655    3    0    0 2.8e-15  3.4e-15
4120    14.06   0.0034234 out 4656 4657 4656    3    0    0  2e-15   1.3e-14
4121   14.063   0.0034234 out 4657 4658 4657    3    0    0 8.4e-15  2.3e-14
4122   14.067   0.0034234 out 4658 4659 4658    3    0    0 2.3e-15   1e-14
4123    14.07   0.0034234 out 4659 4660 4659    3    0    0 3.1e-15  1.7e-14
4124   14.073   0.0034234 out 4660 4661 4660    3    0    0 7.3e-15  7.6e-15
4125   14.077   0.0034234 out 4661 4662 4661    3    0    0 3.9e-15  6.5e-15
4126    14.08   0.0034234 out 4662 4663 4662    3    0    0  1e-15   3.4e-15
4127   14.084   0.0034234 out 4663 4664 4663    3    0    0 3.9e-15   4e-15
4128   14.087   0.0034234 out 4664 4665 4664    3    0    0 9.8e-15  9.7e-15
4129   14.091   0.0034234 out 4665 4666 4665    3    0    0 3.8e-15  8.5e-15
4130   14.094   0.0034234 out 4666 4667 4666    3    0    0 2.4e-16  7.2e-15
4131   14.097   0.0034234 out 4667 4668 4667    3    0    0 1.2e-15  1.2e-15
4132   14.101   0.0034234 out 4668 4669 4668    3    0    0 4.2e-15   7e-15
4133   14.104   0.0034234 out 4669 4670 4669    3    0    0 3.3e-17  5.9e-16
4134   14.108   0.0034234 out 4670 4671 4670    3    0    0  7e-16   8.7e-16
4135   14.111   0.0034234 out 4671 4672 4671    3    0    0 2.8e-15  1.1e-14
4136   14.115   0.0034234 out 4672 4673 4672    3    0    0  1e-14   1.1e-14
4137   14.118   0.0034234 out 4673 4674 4673    3    0    0 8.9e-15  1.7e-14
4138   14.121   0.0034234 out 4674 4675 4674    3    0    0 8.6e-15  9.1e-15
4139   14.125   0.0034234 out 4675 4676 4675    3    0    0 2.4e-15  2.8e-15
4140   14.128   0.0034234 out 4676 4677 4676    3    0    0  8e-16    6e-15
4141   14.132   0.0034234 out 4677 4678 4677    3    0    0  7e-15   8.3e-15
4142   14.135   0.0034234 out 4678 4679 4678    3    0    0 6.4e-15  2.2e-14
4143   14.138   0.0034234 out 4679 4680 4679    3    0    0 5.4e-15  5.7e-15
4144   14.142   0.0034234 out 4680 4681 4680    3    0    0 5.4e-15   2e-14
4145   14.145   0.0034234 out 4681 4682 4681    3    0    0 1.7e-14  2.2e-14
4146   14.149   0.0034234 out 4682 4683 4682    3    0    0 3.5e-15  8.9e-15
4147   14.152   0.0034234 out 4683 4684 4683    3    0    0 1.4e-14  1.7e-14
4148   14.156   0.0034234 out 4684 4685 4684    3    0    0 2.8e-15  1.3e-14
4149   14.159   0.0034234 out 4685 4686 4685    3    0    0 4.6e-15  1.6e-14
4150   14.162   0.0034234 out 4686 4687 4686    3    0    0 3.8e-15  1.6e-14
4151   14.166   0.0034234 out 4687 4688 4687    3    0    0 1.2e-14  1.2e-14
4152   14.169   0.0034234 out 4688 4689 4688    3    0    0 3.7e-15  9.1e-15
4153   14.173   0.0034234 out 4689 4690 4689    3    0    0 1.1e-14  1.1e-14
4154   14.176   0.0034234 out 4690 4691 4690    3    0    0  1e-15    1e-14
4155    14.18   0.0034234 out 4691 4692 4691    3    0    0 5.6e-16  1.1e-14
4156   14.183   0.0034234 out 4692 4693 4692    3    0    0 4.5e-16  1.7e-14
4157   14.186   0.0034234 out 4693 4694 4693    3    0    0 4.2e-15  8.5e-15
4158    14.19   0.0034234 out 4694 4695 4694    3    0    0 7.2e-15  7.3e-15
4159   14.193   0.0034234 out 4695 4696 4695    3    0    0 5.6e-15  5.6e-15
4160   14.197   0.0034234 out 4696 4697 4696    3    0    0  9e-15   1.1e-14
4161    14.2    0.0034234 out 4697 4698 4697    3    0    0 2.6e-15  8.3e-15
4162   14.204   0.0034234 out 4698 4699 4698    3    0    0 2.7e-16  6.5e-15
4163   14.207   0.0034234 out 4699 4700 4699    3    0    0 1.3e-14  1.3e-14
4164    14.21   0.0034234 out 4700 4701 4700    3    0    0 3.3e-16  2.4e-15
4165   14.214   0.0034234 out 4701 4702 4701    3    0    0  2e-14    2e-14
4166   14.217   0.0034234 out 4702 4703 4702    3    0    0 7.4e-15  8.9e-15
4167   14.221   0.0034234 out 4703 4704 4703    3    0    0 1.4e-15  1.2e-14
4168   14.224   0.0034234 out 4704 4705 4704    3    0    0 8.1e-15  1.4e-14
4169   14.227   0.0034234 out 4705 4706 4705    3    0    0 5.1e-15   1e-14
4170   14.231   0.0034234 out 4706 4707 4706    3    0    0 2.7e-16  1.5e-14
4171   14.234   0.0034234 out 4707 4708 4707    3    0    0  2e-15   1.5e-14
4172   14.238   0.0034234 out 4708 4709 4708    3    0    0 7.9e-16  1.4e-15
4173   14.241   0.0034234 out 4709 4710 4709    3    0    0 9.1e-15  1.4e-14
4174   14.245   0.0034234 out 4710 4711 4710    3    0    0 1.4e-14  1.7e-14
4175   14.248   0.0034234 out 4711 4712 4711    3    0    0 6.1e-15  1.2e-14
4176   14.251   0.0034234 out 4712 4713 4712    3    0    0 3.4e-15  1.7e-14
4177   14.255   0.0034234 out 4713 4714 4713    3    0    0  1e-14   1.5e-14
4178   14.258   0.0034234 out 4714 4715 4714    3    0    0 6.4e-16  1.2e-14
4179   14.262   0.0034234 out 4715 4716 4715    3    0    0  4e-15   1.2e-14
4180   14.265   0.0034234 out 4716 4717 4716    3    0    0 4.2e-15  1.7e-14
4181   14.269   0.0034234 out 4717 4718 4717    3    0    0 1.6e-14  2.3e-14
4182   14.272   0.0034234 out 4718 4719 4718    3    0    0 1.1e-14  1.1e-14
4183   14.275   0.0034234 out 4719 4720 4719    3    0    0 9.4e-15  1.6e-14
4184   14.279   0.0034234 out 4720 4721 4720    3    0    0 8.4e-15  1.6e-14
4185   14.282   0.0034234 out 4721 4722 4721    3    0    0 8.2e-15  9.1e-15
4186   14.286   0.0034234 out 4722 4723 4722    3    0    0  8e-15   7.9e-15
4187   14.289   0.0034234 out 4723 4724 4723    3    0    0 3.1e-15  6.5e-15
4188   14.293   0.0034234 out 4724 4725 4724    3    0    0 8.5e-17  6.4e-15
4189   14.296   0.0034234 out 4725 4726 4725    3    0    0 5.3e-15  7.9e-15
4190   14.299   0.0034234 out 4726 4727 4726    3    0    0 4.6e-15   9e-15
4191   14.303   0.0034234 out 4727 4728 4727    3    0    0 4.5e-15  5.7e-15
4192   14.306   0.0034234 out 4728 4729 4728    3    0    0 1.3e-15  1.9e-15
4193    14.31   0.0034234 out 4729 4730 4729    3    0    0  2e-15    2e-15
4194   14.313   0.0034234 out 4730 4731 4730    3    0    0 2.3e-15  1.3e-14
4195   14.317   0.0034234 out 4731 4732 4731    3    0    0 8.4e-15  1.3e-14
4196    14.32   0.0034234 out 4732 4733 4732    3    0    0 1.2e-15  5.2e-15
4197   14.323   0.0034234 out 4733 4734 4733    3    0    0 4.2e-16  4.4e-15
4198   14.327   0.0034234 out 4734 4735 4734    3    0    0  5e-15   6.3e-15
4199    14.33   0.0034234 out 4735 4736 4735    3    0    0 9.5e-17  1.7e-15
4200   14.334   0.0034234 out 4736 4737 4736    3    0    0  1e-14   1.1e-14
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4201   14.337   0.0034234 out 4737 4738 4737   3   0   0 1.4e-15  1.9e-14
4202   14.34    0.0034234 out 4738 4739 4738   3   0   0 9.6e-15  9.5e-15
4203   14.344   0.0034234 out 4739 4740 4739   3   0   0 6.5e-15  8.6e-15
4204   14.347   0.0034234 out 4740 4741 4740   3   0   0 7.1e-15  8.1e-15
4205   14.351   0.0034234 out 4741 4742 4741   3   0   0 3.8e-15  1.1e-14
4206   14.354   0.0034234 out 4742 4743 4742   3   0   0 4.8e-15  5.8e-15
4207   14.358   0.0034234 out 4743 4744 4743   3   0   0 2.4e-15  1.4e-14
4208   14.361   0.0034234 out 4744 4745 4744   3   0   0 1.7e-14  1.7e-14
4209   14.364   0.0034234 out 4745 4746 4745   3   0   0 6.5e-15  7.5e-15
4210   14.368   0.0034234 out 4746 4747 4746   3   0   0 3.3e-15  1.9e-14
4211   14.371   0.0034234 out 4747 4748 4747   3   0   0 6.1e-15  8.3e-15
4212   14.375   0.0034234 out 4748 4749 4748   3   0   0 6.5e-15  6.5e-15
4213   14.378   0.0034234 out 4749 4750 4749   3   0   0  4e-15   6.8e-15
4214   14.382   0.0034234 out 4750 4751 4750   3   0   0 5.2e-16  1.1e-14
4215   14.385   0.0034234 out 4751 4752 4751   3   0   0 1.6e-15  1.6e-15
4216   14.388   0.0034234 out 4752 4753 4752   3   0   0 1.7e-14  1.9e-14
4217   14.392   0.0034234 out 4753 4754 4753   3   0   0  1e-14   2.6e-14
4218   14.395   0.0034234 out 4754 4755 4754   3   0   0 1.7e-14  1.7e-14
4219   14.399   0.0034234 out 4755 4756 4755   3   0   0 4.3e-15  1.9e-14
4220   14.402   0.0034234 out 4756 4757 4756   3   0   0 1.3e-14  1.7e-14
4221   14.406   0.0034234 out 4757 4758 4757   3   0   0  1e-14   1e-14
4222   14.409   0.0034234 out 4758 4759 4758   3   0   0 9.2e-15  1.2e-14
4223   14.412   0.0034234 out 4759 4760 4759   3   0   0 6.2e-15  6.4e-15
4224   14.416   0.0034234 out 4760 4761 4760   3   0   0 7.8e-17  1.3e-14
4225   14.419   0.0034234 out 4761 4762 4761   3   0   0 7.7e-15  8.2e-15
4226   14.423   0.0034234 out 4762 4763 4762   3   0   0 5.1e-15   5e-15
4227   14.426   0.0034234 out 4763 4764 4763   3   0   0 1.6e-14  1.6e-14
4228   14.429   0.0034234 out 4764 4765 4764   3   0   0 3.4e-15  4.9e-15
4229   14.433   0.0034234 out 4765 4766 4765   3   0   0 1.4e-14  2.2e-14
4230   14.436   0.0034234 out 4766 4767 4766   3   0   0 1.8e-14  1.8e-14
4231   14.44    0.0034234 out 4767 4768 4767   3   0   0 9.9e-15  2.6e-14
4232   14.443   0.0034234 out 4768 4769 4768   3   0   0 1.3e-14  1.2e-14
4233   14.447   0.0034234 out 4769 4770 4769   3   0   0 6.2e-15   2e-14
4234   14.45    0.0034234 out 4770 4771 4770   3   0   0 1.4e-14  1.7e-14
4235   14.453   0.0034234 out 4771 4772 4771   3   0   0 1.5e-14  1.4e-14
4236   14.457   0.0034234 out 4772 4773 4772   3   0   0 8.7e-15  2.4e-14
4237   14.46    0.0034234 out 4773 4774 4773   3   0   0 1.3e-14  2.1e-14
4238   14.464   0.0034234 out 4774 4775 4774   3   0   0 9.7e-15  8.4e-15
4239   14.467   0.0034234 out 4775 4776 4775   3   0   0 6.2e-15  4.3e-14
4240   14.471   0.0034234 out 4776 4777 4776   3   0   0 1.2e-14  1.8e-14
4241   14.474   0.0034234 out 4777 4778 4777   3   0   0 3.9e-15   2e-14
4242   14.477   0.0034234 out 4778 4779 4778   3   0   0 3.6e-15  4.8e-15
4243   14.481   0.0034234 out 4779 4780 4779   3   0   0 2.9e-15  1.8e-14
4244   14.484   0.0034234 out 4780 4781 4780   3   0   0 3.4e-15  1.8e-14
4245   14.488   0.0034234 out 4781 4782 4781   3   0   0 7.4e-16  9.7e-16
4246   14.491   0.0034234 out 4782 4783 4782   3   0   0  5e-15   2.3e-14
4247   14.495   0.0034234 out 4783 4784 4783   3   0   0 2.4e-14   2e-14
4248   14.498   0.0034234 out 4784 4785 4784   3   0   0 2.8e-15  1.2e-14
4249   14.501   0.0034234 out 4785 4786 4785   3   0   0  2e-14   3e-14
4250   14.505   0.0034234 out 4786 4787 4786   3   0   0  3e-14   3.6e-14
4251   14.508   0.0034234 out 4787 4788 4787   3   0   0 6.1e-14  5.3e-14
4252   14.512   0.0034234 out 4788 4789 4788   3   0   0 4.3e-14  4.2e-14
4253   14.515   0.0034234 out 4789 4790 4789   3   0   0 1.8e-15  4.3e-14
4254   14.518   0.0034234 out 4790 4791 4790   3   0   0 1.4e-14  2.2e-14
4255   14.522   0.0034234 out 4791 4792 4791   3   0   0 3.9e-14  4.6e-14
4256   14.525   0.0034234 out 4792 4793 4792   3   0   0 1.2e-14  3.9e-14
4257   14.529   0.0034234 out 4793 4794 4793   3   0   0 4.9e-14  4.9e-14
4258   14.532   0.0034234 out 4794 4795 4794   3   0   0 1.9e-14  3.1e-14
4259   14.536   0.0034234 out 4795 4796 4795   3   0   0 5.7e-15  3.5e-14
4260   14.539   0.0034234 out 4796 4797 4796   3   0   0  2e-14   3.1e-14
4261   14.542   0.0034234 out 4797 4798 4797   3   0   0 6.4e-14  5.6e-14
4262   14.546   0.0034234 out 4798 4799 4798   3   0   0 8.1e-15  7.3e-14
4263   14.549   0.0034234 out 4799 4800 4799   3   0   0  1e-13   1.6e-13
4264   14.553   0.0034234 out 4800 4801 4800   3   0   0 2.2e-14  1.2e-14
4265   14.556   0.0034234 out 4801 4802 4801   3   0   0 8.5e-14  2.6e-14
4266   14.56    0.0034234 out 4802 4803 4802   3   0   0 1.8e-13  1.1e-13
4267   14.563   0.0034234 out 4803 4804 4803   3   0   0 1.8e-13  1.7e-13
4268   14.566   0.0034234 out 4804 4805 4804   3   0   0 1.7e-14  1.2e-13
4269   14.57    0.0034234 out 4805 4806 4805   3   0   0 4.7e-14  7.3e-14
4270   14.573   0.0034234 out 4808 4809 4808   3   0   0 1.4e-14  3.1e-18
4271   14.577   0.0034234 out 4810 4811 4810   3   0   0 4.1e-15  2.9e-18
4272   14.58    0.0034234 out 4812 4813 4812   3   0   0 6.8e-15  1.1e-18
4273   14.584   0.0034234 out 4814 4815 4814   3   0   0  1e-14   4e-18
4274   14.587   0.0034234 out 4816 4817 4816   3   0   0 8.1e-15  4.6e-18
4275   14.59    0.0034234 out 4818 4819 4818   3   0   0 1.6e-14  5.6e-18
4276   14.594   0.0034234 out 4820 4821 4820   3   0   0 1.4e-14  2.3e-18
4277   14.597   0.0034234 out 4822 4823 4822   3   0   0 8.2e-14  1.1e-17
4278   14.601   0.0034234 out 4824 4825 4824   3   0   0 4.1e-14  4.7e-17
4279   14.604   0.0034234 out 4826 4827 4826   3   0   0 1.7e-13  6.6e-17
4280   14.607   0.0034234 out 4828 4829 4828   3   0   0 1.3e-14  1.1e-16
4281   14.611   0.0034234 out 4830 4831 4830   3   0   0 5.3e-14  8.7e-18
4282   14.614   0.0034234 out 4832 4833 4832   3   0   0 2.8e-13  3.9e-17
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4283   14.618   0.0034234 out 4834 4835 4834   3   0   0 1.4e-13  5.5e-17
4284   14.621   0.0034234 out 4836 4837 4836   3   0   0 2.4e-14    1e-17
4285   14.625   0.0034234 out 4838 4839 4838   3   0   0 4.5e-14    1e-17
4286   14.628   0.0034234 out 4839 4840 4839   3   0   0 8.6e-15  1.9e-13
4287   14.631   0.0034234 out 4841 4842 4841   3   0   0 1.3e-13  1.2e-17
4288   14.635   0.0034234 out 4843 4844 4843   3   0   0   2e-14  7.8e-18
4289   14.638   0.0034234 out 4845 4846 4845   3   0   0 2.5e-14  2.9e-18
4290   14.642   0.0034234 out 4847 4848 4847   3   0   0 1.9e-14  1.8e-18
4291   14.645   0.0034234 out 4849 4850 4849   3   0   0 3.4e-15  9.9e-19
4292   14.649   0.0034234 out 4851 4852 4851   3   0   0 3.7e-15  5.5e-19
4293   14.652   0.0034234 out 4853 4854 4853   3   0   0 1.3e-15  2.5e-18
4294   14.655   0.0034234 out 4855 4856 4855   3   0   0 1.3e-14  1.1e-18
4295   14.659   0.0034234 out 4857 4858 4857   3   0   0 1.1e-14  2.4e-18
4296   14.662   0.0034234 out 4859 4860 4859   3   0   0   8e-15  8.5e-19
4297   14.666   0.0034234 out 4861 4862 4861   3   0   0 4.4e-14  7.8e-18
4298   14.669   0.0034234 out 4863 4864 4863   3   0   0 1.1e-13  1.1e-17
4299   14.673   0.0034234 out 4865 4866 4865   3   0   0 1.6e-13  1.6e-17
4300   14.676   0.0034234 out 4867 4868 4867   3   0   0 5.1e-14  5.7e-18
4301   14.679   0.0034234 out 4869 4870 4869   3   0   0 2.9e-14  3.2e-18
4302   14.683   0.0034234 out 4871 4872 4871   3   0   0 2.6e-13  4.1e-17
4303   14.686   0.0034234 out 4873 4874 4873   3   0   0   5e-15  8.9e-18
4304   14.69    0.0034234 out 4875 4876 4875   3   0   0 1.9e-13  2.2e-17
4305   14.693   0.0034234 out 4877 4878 4877   3   0   0   1e-13  1.4e-17
4306   14.696   0.0034234 out 4879 4880 4879   3   0   0   5e-14  9.8e-18
4307   14.7     0.0034234 out 4881 4882 4881   3   0   0 3.8e-14  6.9e-17
4308   14.703   0.0034234 out 4883 4884 4883   3   0   0 4.3e-13  5.5e-16
4309   14.707   0.0034234 out 4885 4886 4885   3   0   0 2.8e-14  8.4e-18
4310   14.71    0.0034234 out 4887 4888 4887   3   0   0 1.6e-14  9.7e-18
4311   14.714   0.0034234 out 4889 4890 4889   3   0   0 1.1e-14  8.1e-18
4312   14.717   0.0034234 out 4891 4892 4891   3   0   0 7.2e-15  1.5e-18
4313   14.72    0.0034234 out 4893 4894 4893   3   0   0 5.1e-15  9.6e-19
4314   14.724   0.0034234 out 4895 4896 4895   3   0   0 2.7e-15  2.9e-18
4315   14.727   0.0034234 out 4897 4898 4897   3   0   0 2.5e-15  1.4e-18
4316   14.731   0.0034234 out 4899 4900 4899   3   0   0   6e-15  1.2e-18
4317   14.734   0.0034234 out 4901 4902 4901   3   0   0 1.4e-14  2.9e-18
4318   14.738   0.0034234 out 4904 4905 4904   3   0   0 8.1e-15  1.7e-18
4319   14.741   0.0034234 out 4906 4907 4906   3   0   0 1.2e-14  3.4e-18
4320   14.744   0.0034234 out 4909 4910 4909   3   0   0 5.3e-15  2.8e-18
4321   14.748   0.0034234 out 4911 4912 4911   3   0   0 5.9e-15  2.5e-18
4322   14.751   0.0034234 out 4912 4913 4912   3   0   0 5.5e-14    6e-14
4323   14.755   0.0034234 out 4914 4915 4914   3   0   0 3.7e-15  1.6e-18
4324   14.758   0.0034234 out 4916 4917 4916   3   0   0 4.5e-15  1.9e-18
4325   14.762   0.0034234 out 4918 4919 4918   3   0   0   6e-15  5.2e-18
4326   14.765   0.0034234 out 4920 4921 4920   3   0   0   1e-14  2.9e-18
4327   14.768   0.0034234 out 4923 4924 4923   3   0   0 4.8e-15  1.4e-18
4328   14.772   0.0034234 out 4925 4926 4925   3   0   0 1.2e-14  3.7e-18
4329   14.775   0.0034234 out 4929 4930 4929   3   0   0 2.3e-15    2e-18
4330   14.779   0.0034234 out 4931 4932 4931   3   0   0 9.6e-16  1.3e-18
4331   14.782   0.0034234 out 4934 4935 4934   3   0   0 3.6e-15  2.5e-18
4332   14.786   0.0034234 out 4936 4937 4936   3   0   0 1.6e-15  2.2e-18
4333   14.789   0.0034234 out 4939 4940 4939   3   0   0   7e-16  1.2e-18
4334   14.792   0.0034234 out 4941 4942 4941   3   0   0 1.1e-14  3.8e-18
4335   14.796   0.0034234 out 4944 4945 4944   3   0   0 1.6e-15  6.5e-18
4336   14.799   0.0034234 out 4946 4947 4946   3   0   0 4.8e-16  6.2e-19
4337   14.803   0.0034234 out 4949 4950 4949   3   0   0 4.5e-15  2.6e-18
4338   14.806   0.0034234 out 4951 4952 4951   3   0   0 4.1e-15  1.5e-18
4339   14.809   0.0034234 out 4953 4954 4953   3   0   0 1.9e-15  2.1e-18
4340   14.813   0.0034234 out 4955 4956 4955   3   0   0 6.7e-15  3.4e-18
4341   14.816   0.0034234 out 4956 4957 4956   3   0   0 1.6e-14  1.7e-14
4342   14.82    0.0034234 out 4958 4959 4958   3   0   0 1.1e-14  4.7e-18
4343   14.823   0.0034234 out 4960 4961 4960   3   0   0 1.6e-15  1.4e-18
4344   14.827   0.0034234 out 4962 4963 4962   3   0   0 4.9e-15  3.1e-18
4345   14.83    0.0034234 out 4965 4966 4965   3   0   0 9.5e-16  1.8e-18
4346   14.833   0.0034234 out 4967 4968 4967   3   0   0 4.9e-15  3.4e-18
4347   14.837   0.0034234 out 4968 4969 4968   3   0   0 6.7e-15  6.1e-15
4348   14.84    0.0034234 out 4971 4972 4971   3   0   0 4.3e-15  2.8e-18
4349   14.844   0.0034234 out 4973 4974 4973   3   0   0   6e-15  3.1e-18
4350   14.847   0.0034234 out 4975 4976 4975   3   0   0   1e-15  2.1e-18
4351   14.851   0.0034234 out 4977 4978 4977   3   0   0 1.7e-15  2.7e-18
4352   14.854   0.0034234 out 4979 4980 4979   3   0   0 2.7e-17  3.7e-19
4353   14.857   0.0034234 out 4982 4983 4982   3   0   0 9.6e-15    6e-18
```

Time-stepping completed.
Solution time: 337 s. (5 minutes, 37 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

v0=2 (su3)

General

Description	Value

Solution	v0=2 (sol5)

Log
---------->

2840	8.4238	0.0029808	out	4630 4631 4630	3	0	0	2.4e-15	3.4e-15
2841	8.4268	0.0029808	out	4631 4632 4631	3	0	0	5.8e-15	6.8e-15
2842	8.4298	0.0029808	out	4632 4633 4632	3	0	0	8.5e-15	1.4e-14
2843	8.4328	0.0029808	out	4633 4634 4633	3	0	0	3.7e-16	1.6e-14
2844	8.4358	0.0029808	out	4634 4635 4634	3	0	0	2.8e-15	4e-15
2845	8.4387	0.0029808	out	4635 4636 4635	3	0	0	1.1e-14	1.8e-14
2846	8.4417	0.0029808	out	4636 4637 4636	3	0	0	3.4e-15	3.9e-15
2847	8.4447	0.0029808	out	4637 4638 4637	3	0	0	2.2e-15	5.1e-15
2848	8.4477	0.0029808	out	4638 4639 4638	3	0	0	6e-15	7.5e-15
2849	8.4507	0.0029808	out	4639 4640 4639	3	0	0	4.2e-15	4.8e-15
2850	8.4536	0.0029808	out	4640 4641 4640	3	0	0	5.6e-15	5.8e-15
2851	8.4566	0.0029808	out	4641 4642 4641	3	0	0	5.5e-15	1e-14
2852	8.4596	0.0029808	out	4642 4643 4642	3	0	0	5.5e-16	4.2e-15
2853	8.4626	0.0029808	out	4643 4644 4643	3	0	0	2.1e-15	2.1e-15
2854	8.4656	0.0029808	out	4644 4645 4644	3	0	0	9.6e-15	1.2e-14
2855	8.4686	0.0029808	out	4645 4646 4645	3	0	0	4.8e-15	8.1e-15
2856	8.4715	0.0029808	out	4646 4647 4646	3	0	0	6.8e-15	7.5e-15
2857	8.4745	0.0029808	out	4647 4648 4647	3	0	0	7.3e-17	3.9e-15
2858	8.4775	0.0029808	out	4648 4649 4648	3	0	0	4.4e-15	4.4e-15
2859	8.4805	0.0029808	out	4649 4650 4649	3	0	0	3.4e-15	9.9e-15
2860	8.4835	0.0029808	out	4650 4651 4650	3	0	0	3.2e-15	4.2e-15
2861	8.4864	0.0029808	out	4651 4652 4651	3	0	0	5.3e-15	5.4e-15
2862	8.4894	0.0029808	out	4652 4653 4652	3	0	0	2.1e-15	3.4e-15
2863	8.4924	0.0029808	out	4653 4654 4653	3	0	0	2.8e-15	4e-15
2864	8.4954	0.0029808	out	4654 4655 4654	3	0	0	8.1e-15	8.3e-15
2865	8.4984	0.0029808	out	4655 4656 4655	3	0	0	1.5e-15	3.9e-15
2866	8.5013	0.0029808	out	4656 4657 4656	3	0	0	2.8e-16	1.3e-15
2867	8.5043	0.0029808	out	4657 4658 4657	3	0	0	1.5e-15	5.7e-15
2868	8.5073	0.0029808	out	4658 4659 4658	3	0	0	4.3e-15	1.1e-14
2869	8.5103	0.0029808	out	4659 4660 4659	3	0	0	5.1e-15	8.9e-15
2870	8.5133	0.0029808	out	4660 4661 4660	3	0	0	3.9e-15	7.1e-15
2871	8.5162	0.0029808	out	4661 4662 4661	3	0	0	5.7e-15	6.1e-15
2872	8.5192	0.0029808	out	4662 4663 4662	3	0	0	9.9e-16	2.9e-15
2873	8.5222	0.0029808	out	4663 4664 4663	3	0	0	7.7e-15	9.6e-15
2874	8.5252	0.0029808	out	4664 4665 4664	3	0	0	5.2e-15	6.1e-15
2875	8.5282	0.0029808	out	4665 4666 4665	3	0	0	3.1e-15	1.3e-14
2876	8.5311	0.0029808	out	4666 4667 4666	3	0	0	7.8e-16	1.1e-14
2877	8.5341	0.0029808	out	4667 4668 4667	3	0	0	8.4e-15	9.4e-15
2878	8.5371	0.0029808	out	4668 4669 4668	3	0	0	3.4e-16	9.2e-15
2879	8.5401	0.0029808	out	4669 4670 4669	3	0	0	9.8e-15	1e-14
2880	8.5431	0.0029808	out	4670 4671 4670	3	0	0	3.3e-15	1.2e-14
2881	8.5461	0.0029808	out	4671 4672 4671	3	0	0	5.5e-15	8.2e-15
2882	8.549	0.0029808	out	4672 4673 4672	3	0	0	2.3e-15	2.3e-15
2883	8.552	0.0029808	out	4673 4674 4673	3	0	0	8.8e-15	1.1e-14
2884	8.555	0.0029808	out	4674 4675 4674	3	0	0	5.9e-15	6.9e-15
2885	8.558	0.0029808	out	4675 4676 4675	3	0	0	9.6e-15	1.9e-14
2886	8.561	0.0029808	out	4676 4677 4676	3	0	0	5.6e-15	6.6e-15
2887	8.5639	0.0029808	out	4677 4678 4677	3	0	0	8.9e-15	1e-14
2888	8.5669	0.0029808	out	4678 4679 4678	3	0	0	8e-15	1e-14
2889	8.5699	0.0029808	out	4679 4680 4679	3	0	0	2.7e-15	4.1e-15
2890	8.5729	0.0029808	out	4680 4681 4680	3	0	0	1.6e-15	4e-15
2891	8.5759	0.0029808	out	4681 4682 4681	3	0	0	9.8e-16	5.9e-15
2892	8.5788	0.0029808	out	4682 4683 4682	3	0	0	5.1e-16	5.6e-15
2893	8.5818	0.0029808	out	4683 4684 4683	3	0	0	2.4e-15	2.7e-15
2894	8.5848	0.0029808	out	4684 4685 4684	3	0	0	1.1e-14	1.4e-14
2895	8.5878	0.0029808	out	4685 4686 4685	3	0	0	4.6e-15	6.9e-15
2896	8.5908	0.0029808	out	4686 4687 4686	3	0	0	6.3e-15	1.1e-14
2897	8.5937	0.0029808	out	4687 4688 4687	3	0	0	3.3e-16	6.6e-16
2898	8.5967	0.0029808	out	4688 4689 4688	3	0	0	2.7e-15	3.1e-15
2899	8.5997	0.0029808	out	4689 4690 4689	3	0	0	8.2e-15	8.8e-15
2900	8.6027	0.0029808	out	4690 4691 4690	3	0	0	1.2e-14	1.6e-14
2901	8.6057	0.0029808	out	4691 4692 4691	3	0	0	3.3e-15	4.9e-15
2902	8.6086	0.0029808	out	4692 4693 4692	3	0	0	3.8e-15	3.8e-15
2903	8.6116	0.0029808	out	4693 4694 4693	3	0	0	3.7e-15	7.7e-15
2904	8.6146	0.0029808	out	4694 4695 4694	3	0	0	4.7e-15	7.3e-15
2905	8.6176	0.0029808	out	4695 4696 4695	3	0	0	2.8e-15	3.7e-15
2906	8.6206	0.0029808	out	4696 4697 4696	3	0	0	3.9e-15	5.1e-15
2907	8.6236	0.0029808	out	4697 4698 4697	3	0	0	1.1e-15	1.3e-15
2908	8.6265	0.0029808	out	4698 4699 4698	3	0	0	1.2e-14	1.2e-14
2909	8.6295	0.0029808	out	4699 4700 4699	3	0	0	8.1e-15	1.1e-14
2910	8.6325	0.0029808	out	4700 4701 4700	3	0	0	3e-15	3.5e-15
2911	8.6355	0.0029808	out	4701 4702 4701	3	0	0	2.4e-15	6.4e-15
2912	8.6385	0.0029808	out	4702 4703 4702	3	0	0	4.6e-15	9.8e-15
2913	8.6414	0.0029808	out	4703 4704 4703	3	0	0	4.2e-15	4.4e-15
2914	8.6444	0.0029808	out	4704 4705 4704	3	0	0	6.6e-15	1.4e-14
2915	8.6474	0.0029808	out	4705 4706 4705	3	0	0	4.1e-15	5.3e-15
2916	8.6504	0.0029808	out	4706 4707 4706	3	0	0	1.2e-15	2.7e-15
2917	8.6534	0.0029808	out	4707 4708 4707	3	0	0	3.6e-15	5.6e-15
2918	8.6563	0.0029808	out	4708 4709 4708	3	0	0	2.7e-15	8.2e-15

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2919   8.6593  0.0029808 out 4709 4710 4709   3   0   0 6.9e-16 5.3e-15
2920   8.6623  0.0029808 out 4710 4711 4710   3   0   0 5.8e-15 5.9e-15
2921   8.6653  0.0029808 out 4711 4712 4711   3   0   0  6e-15 6.4e-15
2922   8.6683  0.0029808 out 4712 4713 4712   3   0   0 7.9e-17 1.6e-14
2923   8.6712  0.0029808 out 4713 4714 4713   3   0   0 5.7e-15 5.7e-15
2924   8.6742  0.0029808 out 4714 4715 4714   3   0   0  6e-16 1.8e-15
2925   8.6772  0.0029808 out 4715 4716 4715   3   0   0 3.1e-15 4.6e-15
2926   8.6802  0.0029808 out 4716 4717 4716   3   0   0 1.6e-15 6.2e-15
2927   8.6832  0.0029808 out 4717 4718 4717   3   0   0 5.9e-15 1.4e-14
2928   8.6862  0.0029808 out 4718 4719 4718   3   0   0 4.2e-15 4.6e-15
2929   8.6891  0.0029808 out 4719 4720 4719   3   0   0 2.5e-15 5.4e-15
2930   8.6921  0.0029808 out 4720 4721 4720   3   0   0  7e-15 7.5e-15
2931   8.6951  0.0029808 out 4721 4722 4721   3   0   0 7.5e-15 7.6e-15
2932   8.6981  0.0029808 out 4722 4723 4722   3   0   0 5.5e-15 7.9e-15
2933   8.7011  0.0029808 out 4723 4724 4723   3   0   0 2.7e-15 3.7e-15
2934   8.704   0.0029808 out 4724 4725 4724   3   0   0 7.4e-15 1.7e-14
2935   8.707   0.0029808 out 4725 4726 4725   3   0   0 4.4e-15 5.5e-15
2936   8.71    0.0029808 out 4726 4727 4726   3   0   0 6.8e-17 5.8e-15
2937   8.713   0.0029808 out 4727 4728 4727   3   0   0 1.3e-15 1.1e-14
2938   8.716   0.0029808 out 4728 4729 4728   3   0   0 2.2e-15 5.6e-15
2939   8.7189  0.0029808 out 4729 4730 4729   3   0   0  2e-15 7.2e-15
2940   8.7219  0.0029808 out 4730 4731 4730   3   0   0 8.6e-15 8.6e-15
2941   8.7249  0.0029808 out 4731 4732 4731   3   0   0 8.3e-16 2.1e-15
2942   8.7279  0.0029808 out 4732 4733 4732   3   0   0 8.4e-15 1.2e-14
2943   8.7309  0.0029808 out 4733 4734 4733   3   0   0 5.7e-15 6.4e-15
2944   8.7338  0.0029808 out 4734 4735 4734   3   0   0 1.6e-14 1.6e-14
2945   8.7368  0.0029808 out 4735 4736 4735   3   0   0 8.8e-15 1.1e-14
2946   8.7398  0.0029808 out 4736 4737 4736   3   0   0 2.9e-16  2e-14
2947   8.7428  0.0029808 out 4737 4738 4737   3   0   0 1.7e-14 1.7e-14
2948   8.7458  0.0029808 out 4738 4739 4738   3   0   0 7.5e-15 8.5e-15
2949   8.7487  0.0029808 out 4739 4740 4739   3   0   0 2.8e-15 8.3e-15
2950   8.7517  0.0029808 out 4740 4741 4740   3   0   0 2.6e-15 5.8e-15
2951   8.7547  0.0029808 out 4741 4742 4741   3   0   0 6.3e-15 7.2e-15
2952   8.7577  0.0029808 out 4742 4743 4742   3   0   0 2.7e-15 8.2e-15
2953   8.7607  0.0029808 out 4743 4744 4743   3   0   0 6.9e-16 5.1e-15
2954   8.7637  0.0029808 out 4744 4745 4744   3   0   0 5.2e-15 1.6e-14
2955   8.7666  0.0029808 out 4745 4746 4745   3   0   0 1.7e-15 2.2e-15
2956   8.7696  0.0029808 out 4746 4747 4746   3   0   0 2.5e-15 2.8e-15
2957   8.7726  0.0029808 out 4747 4748 4747   3   0   0 2.1e-15  1e-14
2958   8.7756  0.0029808 out 4748 4749 4748   3   0   0 6.2e-16 9.2e-16
2959   8.7786  0.0029808 out 4749 4750 4749   3   0   0 6.7e-15 7.1e-15
2960   8.7815  0.0029808 out 4750 4751 4750   3   0   0 1.8e-15 1.1e-14
2961   8.7845  0.0029808 out 4751 4752 4751   3   0   0 7.8e-16 9.3e-16
2962   8.7875  0.0029808 out 4752 4753 4752   3   0   0 4.5e-15 2.1e-14
2963   8.7905  0.0029808 out 4753 4754 4753   3   0   0 5.1e-15 8.8e-15
2964   8.7935  0.0029808 out 4754 4755 4754   3   0   0 4.9e-15 1.2e-14
2965   8.7964  0.0029808 out 4755 4756 4755   3   0   0 2.2e-15 1.7e-14
2966   8.7994  0.0029808 out 4756 4757 4756   3   0   0 1.6e-14 1.7e-14
2967   8.8024  0.0029808 out 4757 4758 4757   3   0   0 4.4e-15 8.6e-15
2968   8.8054  0.0029808 out 4758 4759 4758   3   0   0 4.3e-15 4.3e-15
2969   8.8084  0.0029808 out 4759 4760 4759   3   0   0 6.1e-15 1.1e-14
2970   8.8113  0.0029808 out 4760 4761 4760   3   0   0  8e-17 1.6e-14
2971   8.8143  0.0029808 out 4761 4762 4761   3   0   0 1.6e-16 1.2e-14
2972   8.8173  0.0029808 out 4762 4763 4762   3   0   0 7.2e-15 7.3e-15
2973   8.8203  0.0029808 out 4763 4764 4763   3   0   0 1.2e-14 1.3e-14
2974   8.8233  0.0029808 out 4764 4765 4764   3   0   0 5.6e-15  7e-15
2975   8.8263  0.0029808 out 4765 4766 4765   3   0   0  9e-15 9.2e-15
2976   8.8292  0.0029808 out 4766 4767 4766   3   0   0 2.2e-15  2e-14
2977   8.8322  0.0029808 out 4767 4768 4767   3   0   0 2.9e-15 4.5e-15
2978   8.8352  0.0029808 out 4768 4769 4768   3   0   0 4.3e-15 8.6e-15
2979   8.8382  0.0029808 out 4769 4770 4769   3   0   0 4.7e-15  1e-14
2980   8.8412  0.0029808 out 4770 4771 4770   3   0   0 2.2e-15 8.1e-15
2981   8.8441  0.0029808 out 4771 4772 4771   3   0   0 4.3e-15 6.3e-15
2982   8.8471  0.0029808 out 4772 4773 4772   3   0   0 7.9e-15 1.3e-14
2983   8.8501  0.0029808 out 4773 4774 4773   3   0   0 1.3e-14 1.3e-14
2984   8.8531  0.0029808 out 4774 4775 4774   3   0   0 6.5e-15 8.5e-15
2985   8.8561  0.0029808 out 4775 4776 4775   3   0   0 1.2e-15 7.4e-15
2986   8.859   0.0029808 out 4776 4777 4776   3   0   0 3.4e-15 3.9e-15
2987   8.862   0.0029808 out 4777 4778 4777   3   0   0 7.9e-15 1.2e-14
2988   8.865   0.0029808 out 4778 4779 4778   3   0   0 4.5e-15 1.8e-14
2989   8.868   0.0029808 out 4779 4780 4779   3   0   0 6.5e-16 1.6e-15
2990   8.871   0.0029808 out 4780 4781 4780   3   0   0 4.6e-15  1e-14
2991   8.8739  0.0029808 out 4781 4782 4781   3   0   0 1.6e-16 9.7e-15
2992   8.8769  0.0029808 out 4782 4783 4782   3   0   0 6.2e-15 6.2e-15
2993   8.8799  0.0029808 out 4783 4784 4783   3   0   0 2.8e-15 2.8e-15
2994   8.8829  0.0029808 out 4784 4785 4784   3   0   0 1.4e-15 1.3e-14
2995   8.8859  0.0029808 out 4785 4786 4785   3   0   0 3.6e-15  4e-15
2996   8.8888  0.0029808 out 4786 4787 4786   3   0   0 2.3e-15 7.5e-16
2997   8.8918  0.0029808 out 4787 4788 4787   3   0   0 5.6e-15 8.2e-16
2998   8.8948  0.0029808 out 4788 4789 4788   3   0   0 2.6e-15 3.5e-15
2999   8.8978  0.0029808 out 4789 4790 4789   3   0   0 5.5e-16 1.9e-14
3000   8.9008  0.0029808 out 4790 4791 4790   3   0   0 8.4e-15 8.9e-15
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3001	8.9038	0.0029808	out	4791 4792 4791	3	0	0	1.6e-14	1.6e-14
3002	8.9067	0.0029808	out	4792 4793 4792	3	0	0	1.4e-15	1.5e-15
3003	8.9097	0.0029808	out	4793 4794 4793	3	0	0	6e-15	7.7e-15
3004	8.9127	0.0029808	out	4794 4795 4794	3	0	0	3.2e-15	5.2e-15
3005	8.9157	0.0029808	out	4795 4796 4795	3	0	0	9.8e-15	1.1e-14
3006	8.9187	0.0029808	out	4796 4797 4796	3	0	0	1.9e-15	2.1e-15
3007	8.9216	0.0029808	out	4797 4798 4797	3	0	0	3.5e-15	1.3e-14
3008	8.9246	0.0029808	out	4798 4799 4798	3	0	0	8.1e-16	5.3e-15
3009	8.9276	0.0029808	out	4799 4800 4799	3	0	0	3.8e-15	6.8e-15
3010	8.9306	0.0029808	out	4800 4801 4800	3	0	0	2.7e-15	1.6e-14
3011	8.9336	0.0029808	out	4801 4802 4801	3	0	0	7.5e-15	8.1e-15
3012	8.9365	0.0029808	out	4802 4803 4802	3	0	0	9.6e-15	1.1e-14
3013	8.9395	0.0029808	out	4803 4804 4803	3	0	0	4.3e-15	4.9e-15
3014	8.9425	0.0029808	out	4804 4805 4804	3	0	0	2.8e-15	4e-15
3015	8.9455	0.0029808	out	4805 4806 4805	3	0	0	8.9e-15	1.5e-14
3016	8.9485	0.0029808	out	4806 4807 4806	3	0	0	6e-15	1.1e-14
3017	8.9514	0.0029808	out	4807 4808 4807	3	0	0	1.3e-14	1.5e-14
3018	8.9544	0.0029808	out	4808 4809 4808	3	0	0	4.6e-16	1.5e-14
3019	8.9574	0.0029808	out	4809 4810 4809	3	0	0	2.6e-15	1.3e-14
3020	8.9604	0.0029808	out	4810 4811 4810	3	0	0	2e-15	1.5e-14
3021	8.9634	0.0029808	out	4811 4812 4811	3	0	0	7.9e-16	1.1e-14
3022	8.9663	0.0029808	out	4812 4813 4812	3	0	0	2e-16	6.3e-15
3023	8.9693	0.0029808	out	4813 4814 4813	3	0	0	7.5e-15	1.1e-14
3024	8.9723	0.0029808	out	4814 4815 4814	3	0	0	2.6e-15	2.8e-15
3025	8.9753	0.0029808	out	4815 4816 4815	3	0	0	8e-16	1.6e-14
3026	8.9783	0.0029808	out	4816 4817 4816	3	0	0	2e-15	6.8e-15
3027	8.9813	0.0029808	out	4817 4818 4817	3	0	0	1.3e-15	6.9e-15
3028	8.9842	0.0029808	out	4818 4819 4818	3	0	0	3.8e-15	8.8e-15
3029	8.9872	0.0029808	out	4819 4820 4819	3	0	0	5.8e-16	3.4e-15
3030	8.9902	0.0029808	out	4820 4821 4820	3	0	0	5.6e-15	8.4e-15
3031	8.9932	0.0029808	out	4821 4822 4821	3	0	0	9.4e-15	9.8e-15
3032	8.9962	0.0029808	out	4822 4823 4822	3	0	0	4.7e-15	6.1e-15
3033	8.9991	0.0029808	out	4823 4824 4823	3	0	0	6.1e-15	6.4e-15
3034	9.0021	0.0029808	out	4824 4825 4824	3	0	0	7e-15	7e-15
3035	9.0051	0.0029808	out	4825 4826 4825	3	0	0	4.7e-15	6.7e-15
3036	9.0081	0.0029808	out	4826 4827 4826	3	0	0	2e-15	4.8e-15
3037	9.0111	0.0029808	out	4827 4828 4827	3	0	0	8.6e-15	8.6e-15
3038	9.014	0.0029808	out	4828 4829 4828	3	0	0	1.1e-15	5.2e-15
3039	9.017	0.0029808	out	4829 4830 4829	3	0	0	4.5e-15	4.7e-15
3040	9.02	0.0029808	out	4830 4831 4830	3	0	0	8.1e-16	9.5e-15
3041	9.023	0.0029808	out	4831 4832 4831	3	0	0	2.5e-15	8.3e-15
3042	9.026	0.0029808	out	4832 4833 4832	3	0	0	5.7e-15	6.2e-15
3043	9.0289	0.0029808	out	4833 4834 4833	3	0	0	1.8e-15	6.7e-15
3044	9.0319	0.0029808	out	4834 4835 4834	3	0	0	5.3e-15	1.2e-14
3045	9.0349	0.0029808	out	4835 4836 4835	3	0	0	7.6e-15	1.6e-14
3046	9.0379	0.0029808	out	4836 4837 4836	3	0	0	2.6e-15	3e-15
3047	9.0409	0.0029808	out	4837 4838 4837	3	0	0	1.8e-15	2.7e-15
3048	9.0439	0.0029808	out	4838 4839 4838	3	0	0	2.8e-15	2.9e-15
3049	9.0468	0.0029808	out	4839 4840 4839	3	0	0	1.4e-14	1.4e-14
3050	9.0498	0.0029808	out	4840 4841 4840	3	0	0	5.1e-15	1.4e-14
3051	9.0528	0.0029808	out	4841 4842 4841	3	0	0	2.5e-15	3.5e-15
3052	9.0558	0.0029808	out	4842 4843 4842	3	0	0	4.6e-15	1.5e-14
3053	9.0588	0.0029808	out	4843 4844 4843	3	0	0	8.7e-15	1e-14
3054	9.0617	0.0029808	out	4844 4845 4844	3	0	0	4.5e-16	5.3e-15
3055	9.0647	0.0029808	out	4845 4846 4845	3	0	0	4.4e-15	6e-15
3056	9.0677	0.0029808	out	4846 4847 4846	3	0	0	2.3e-15	4.9e-15
3057	9.0707	0.0029808	out	4847 4848 4847	3	0	0	1.3e-15	1.4e-15
3058	9.0737	0.0029808	out	4848 4849 4848	3	0	0	7.7e-15	7.7e-15
3059	9.0766	0.0029808	out	4849 4850 4849	3	0	0	4.2e-15	9.3e-15
3060	9.0796	0.0029808	out	4850 4851 4850	3	0	0	5.5e-15	8.9e-15
3061	9.0826	0.0029808	out	4851 4852 4851	3	0	0	5.9e-17	1.2e-14
3062	9.0856	0.0029808	out	4852 4853 4852	3	0	0	2.2e-15	1e-14
3063	9.0886	0.0029808	out	4853 4854 4853	3	0	0	3.5e-15	5.5e-15
3064	9.0915	0.0029808	out	4854 4855 4854	3	0	0	3.1e-15	5.7e-15
3065	9.0945	0.0029808	out	4855 4856 4855	3	0	0	8.8e-15	1e-14
3066	9.0975	0.0029808	out	4856 4857 4856	3	0	0	2.9e-16	4.5e-15
3067	9.1005	0.0029808	out	4857 4858 4857	3	0	0	5e-15	5.9e-15
3068	9.1035	0.0029808	out	4858 4859 4858	3	0	0	3.4e-15	9e-15
3069	9.1064	0.0029808	out	4859 4860 4859	3	0	0	3e-15	1.2e-14
3070	9.1094	0.0029808	out	4860 4861 4860	3	0	0	3.9e-15	6.7e-15
3071	9.1124	0.0029808	out	4861 4862 4861	3	0	0	1.1e-16	3.6e-15
3072	9.1154	0.0029808	out	4862 4863 4862	3	0	0	2.5e-15	2.8e-15
3073	9.1184	0.0029808	out	4863 4864 4863	3	0	0	4.7e-15	9.8e-15
3074	9.1214	0.0029808	out	4864 4865 4864	3	0	0	6.9e-15	7e-15
3075	9.1243	0.0029808	out	4865 4866 4865	3	0	0	1.5e-15	1e-14
3076	9.1273	0.0029808	out	4866 4867 4866	3	0	0	4.8e-15	5.9e-15
3077	9.1303	0.0029808	out	4867 4868 4867	3	0	0	2.2e-15	7.8e-15
3078	9.1333	0.0029808	out	4868 4869 4868	3	0	0	3.9e-15	5.1e-15
3079	9.1363	0.0029808	out	4869 4870 4869	3	0	0	3.3e-15	4.8e-15
3080	9.1392	0.0029808	out	4870 4871 4870	3	0	0	3.9e-15	4.3e-15
3081	9.1422	0.0029808	out	4871 4872 4871	3	0	0	6.2e-15	8.9e-15
3082	9.1452	0.0029808	out	4872 4873 4872	3	0	0	4.2e-15	1.3e-14

3083	9.1482	0.0029808	out	4873	4874	4873	3	0	0 2.9e-15	3.6e-15
3084	9.1512	0.0029808	out	4874	4875	4874	3	0	0 5.5e-15	9.9e-15
3085	9.1541	0.0029808	out	4875	4876	4875	3	0	0 3.4e-15	3.8e-15
3086	9.1571	0.0029808	out	4876	4877	4876	3	0	0 2.7e-16	2.5e-15
3087	9.1601	0.0029808	out	4877	4878	4877	3	0	0 2.4e-17	7.5e-16
3088	9.1631	0.0029808	out	4878	4879	4878	3	0	0 9.8e-16	4.6e-15
3089	9.1661	0.0029808	out	4879	4880	4879	3	0	0 4.6e-15	6e-15
3090	9.169	0.0029808	out	4880	4881	4880	3	0	0 1.8e-15	2.5e-15
3091	9.172	0.0029808	out	4881	4882	4881	3	0	0 3.1e-15	4.2e-15
3092	9.175	0.0029808	out	4882	4883	4882	3	0	0 8.4e-15	8.6e-15
3093	9.178	0.0029808	out	4883	4884	4883	3	0	0 5.9e-15	7.3e-15
3094	9.181	0.0029808	out	4884	4885	4884	3	0	0 1.3e-14	1.4e-14
3095	9.184	0.0029808	out	4885	4886	4885	3	0	0 1.3e-15	2.8e-15
3096	9.1869	0.0029808	out	4886	4887	4886	3	0	0 5.2e-15	7.2e-15
3097	9.1899	0.0029808	out	4887	4888	4887	3	0	0 3.8e-15	1.2e-14
3098	9.1929	0.0029808	out	4888	4889	4888	3	0	0 5.8e-15	1.3e-14
3099	9.1959	0.0029808	out	4889	4890	4889	3	0	0 3.9e-16	7.7e-15
3100	9.1989	0.0029808	out	4890	4891	4890	3	0	0 1.4e-14	1.4e-14
3101	9.2018	0.0029808	out	4891	4892	4891	3	0	0 4.9e-15	6.6e-15
3102	9.2048	0.0029808	out	4892	4893	4892	3	0	0 2.3e-15	7e-15
3103	9.2078	0.0029808	out	4893	4894	4893	3	0	0 4e-15	9e-15
3104	9.2108	0.0029808	out	4894	4895	4894	3	0	0 6.9e-15	8.8e-15
3105	9.2138	0.0029808	out	4895	4896	4895	3	0	0 3.2e-15	6.2e-15
3106	9.2167	0.0029808	out	4896	4897	4896	3	0	0 3.5e-15	6.4e-15
3107	9.2197	0.0029808	out	4897	4898	4897	3	0	0 4.5e-16	1.1e-14
3108	9.2227	0.0029808	out	4898	4899	4898	3	0	0 9.2e-15	1.1e-14
3109	9.2257	0.0029808	out	4899	4900	4899	3	0	0 3.8e-15	4.9e-15
3110	9.2287	0.0029808	out	4900	4901	4900	3	0	0 9.7e-16	1e-15
3111	9.2316	0.0029808	out	4901	4902	4901	3	0	0 2.9e-15	6.6e-15
3112	9.2346	0.0029808	out	4902	4903	4902	3	0	0 5.5e-15	7.2e-15
3113	9.2376	0.0029808	out	4903	4904	4903	3	0	0 6.2e-15	7.1e-15
3114	9.2406	0.0029808	out	4904	4905	4904	3	0	0 1.2e-15	3.7e-15
3115	9.2436	0.0029808	out	4905	4906	4905	3	0	0 1.7e-15	1.9e-15
3116	9.2465	0.0029808	out	4906	4907	4906	3	0	0 1.9e-15	2e-15
3117	9.2495	0.0029808	out	4907	4908	4907	3	0	0 1.4e-14	1.4e-14
3118	9.2525	0.0029808	out	4908	4909	4908	3	0	0 3.3e-15	1e-14
3119	9.2555	0.0029808	out	4909	4910	4909	3	0	0 3e-15	7.8e-15
3120	9.2585	0.0029808	out	4910	4911	4910	3	0	0 5.1e-15	6.8e-15
3121	9.2615	0.0029808	out	4911	4912	4911	3	0	0 6e-16	6.8e-15
3122	9.2644	0.0029808	out	4912	4913	4912	3	0	0 3.5e-15	1.1e-14
3123	9.2674	0.0029808	out	4913	4914	4913	3	0	0 1.9e-15	2.5e-15
3124	9.2704	0.0029808	out	4914	4915	4914	3	0	0 5.6e-15	7.9e-15
3125	9.2734	0.0029808	out	4915	4916	4915	3	0	0 5.4e-15	6.5e-15
3126	9.2764	0.0029808	out	4916	4917	4916	3	0	0 5.7e-15	9.8e-15
3127	9.2793	0.0029808	out	4917	4918	4917	3	0	0 9e-15	1e-14
3128	9.2823	0.0029808	out	4918	4919	4918	3	0	0 4e-16	8.2e-15
3129	9.2853	0.0029808	out	4919	4920	4919	3	0	0 5.7e-15	7.8e-15
3130	9.2883	0.0029808	out	4920	4921	4920	3	0	0 2e-15	1e-14
3131	9.2913	0.0029808	out	4921	4922	4921	3	0	0 1.8e-16	3.1e-15
3132	9.2942	0.0029808	out	4922	4923	4922	3	0	0 1.6e-15	1.1e-14
3133	9.2972	0.0029808	out	4923	4924	4923	3	0	0 1.6e-15	1.8e-15
3134	9.3002	0.0029808	out	4924	4925	4924	3	0	0 1.4e-15	4e-15
3135	9.3032	0.0029808	out	4925	4926	4925	3	0	0 2.9e-15	5.3e-15
3136	9.3062	0.0029808	out	4926	4927	4926	3	0	0 3.7e-15	3.7e-15
3137	9.3091	0.0029808	out	4927	4928	4927	3	0	0 1.8e-15	9.5e-15
3138	9.3121	0.0029808	out	4928	4929	4928	3	0	0 3.6e-15	7.2e-15
3139	9.3151	0.0029808	out	4929	4930	4929	3	0	0 3.7e-15	5e-15
3140	9.3181	0.0029808	out	4930	4931	4930	3	0	0 1.5e-15	7e-15
3141	9.3211	0.0029808	out	4931	4932	4931	3	0	0 2.1e-15	3.3e-15
3142	9.324	0.0029808	out	4932	4933	4932	3	0	0 2.5e-15	3.4e-15
3143	9.327	0.0029808	out	4933	4934	4933	3	0	0 9.1e-15	9.6e-15
3144	9.33	0.0029808	out	4934	4935	4934	3	0	0 7.5e-15	7.7e-15
3145	9.333	0.0029808	out	4935	4936	4935	3	0	0 6.7e-17	8.1e-16
3146	9.336	0.0029808	out	4936	4937	4936	3	0	0 1e-15	3.2e-15
3147	9.339	0.0029808	out	4937	4938	4937	3	0	0 2e-15	5.4e-15
3148	9.3419	0.0029808	out	4938	4939	4938	3	0	0 8.7e-17	6.6e-16
3149	9.3449	0.0029808	out	4939	4940	4939	3	0	0 3.4e-15	3.4e-15
3150	9.3479	0.0029808	out	4940	4941	4940	3	0	0 8.1e-15	1.2e-14
3151	9.3509	0.0029808	out	4941	4942	4941	3	0	0 1.1e-15	2.8e-15
3152	9.3539	0.0029808	out	4942	4943	4942	3	0	0 1.8e-15	8.1e-15
3153	9.3568	0.0029808	out	4943	4944	4943	3	0	0 2.5e-15	1e-14
3154	9.3598	0.0029808	out	4944	4945	4944	3	0	0 2.2e-16	6.4e-15
3155	9.3628	0.0029808	out	4945	4946	4945	3	0	0 2.7e-15	5.5e-15
3156	9.3658	0.0029808	out	4946	4947	4946	3	0	0 1.8e-17	1.6e-15
3157	9.3688	0.0029808	out	4947	4948	4947	3	0	0 1e-15	1.2e-14
3158	9.3717	0.0029808	out	4948	4949	4948	3	0	0 3.7e-15	5.1e-15
3159	9.3747	0.0029808	out	4949	4950	4949	3	0	0 5e-15	5.2e-15
3160	9.3777	0.0029808	out	4950	4951	4950	3	0	0 1.5e-15	4.2e-15
3161	9.3807	0.0029808	out	4951	4952	4951	3	0	0 3.2e-15	1e-14
3162	9.3837	0.0029808	out	4952	4953	4952	3	0	0 4.4e-15	1.2e-14
3163	9.3866	0.0029808	out	4953	4954	4953	3	0	0 1.9e-15	2.1e-15
3164	9.3896	0.0029808	out	4954	4955	4954	3	0	0 3.5e-15	3.5e-15

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3165   9.3926   0.0029808 out 4955 4956 4955    3   0    0 6.1e-16 1.5e-15
3166   9.3956   0.0029808 out 4956 4957 4956    3   0    0 1.3e-15 5.3e-15
3167   9.3986   0.0029808 out 4957 4958 4957    3   0    0 3.9e-15   4e-15
3168   9.4016   0.0029808 out 4958 4959 4958    3   0    0 4.7e-15 6.1e-15
3169   9.4045   0.0029808 out 4959 4960 4959    3   0    0 1.5e-15 4.6e-15
3170   9.4075   0.0029808 out 4960 4961 4960    3   0    0 7.9e-16 4.2e-15
3171   9.4105   0.0029808 out 4961 4962 4961    3   0    0 1.9e-15 3.2e-15
3172   9.4135   0.0029808 out 4962 4963 4962    3   0    0 5.8e-15 9.3e-15
3173   9.4165   0.0029808 out 4963 4964 4963    3   0    0 1.6e-14 1.8e-14
3174   9.4194   0.0029808 out 4964 4965 4964    3   0    0 2.6e-15 3.5e-15
3175   9.4224   0.0029808 out 4965 4966 4965    3   0    0 1.2e-14 1.3e-14
3176   9.4254   0.0029808 out 4966 4967 4966    3   0    0 3.2e-15 8.8e-15
3177   9.4284   0.0029808 out 4967 4968 4967    3   0    0 1.9e-15 5.7e-15
3178   9.4314   0.0029808 out 4968 4969 4968    3   0    0 4.6e-15 7.9e-15
3179   9.4343   0.0029808 out 4969 4970 4969    3   0    0 3.4e-15 3.4e-15
3180   9.4373   0.0029808 out 4970 4971 4970    3   0    0 4.5e-15   6e-15
3181   9.4403   0.0029808 out 4971 4972 4971    3   0    0 1.2e-15 4.9e-15
3182   9.4433   0.0029808 out 4972 4973 4972    3   0    0   2e-16 2.8e-16
3183   9.4463   0.0029808 out 4973 4974 4973    3   0    0 7.6e-15 8.6e-15
3184   9.4492   0.0029808 out 4974 4975 4974    3   0    0   1e-15 6.2e-15
3185   9.4522   0.0029808 out 4975 4976 4975    3   0    0   2e-15 7.1e-15
3186   9.4552   0.0029808 out 4976 4977 4976    3   0    0 8.1e-15 8.4e-15
3187   9.4582   0.0029808 out 4977 4978 4977    3   0    0 2.6e-15 2.6e-15
3188   9.4612   0.0029808 out 4978 4979 4978    3   0    0 2.3e-15   4e-15
3189   9.4641   0.0029808 out 4979 4980 4979    3   0    0 3.5e-15 5.5e-15
```
Time-stepping completed.
Solution time: 337 s. (5 minutes, 37 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) --------------------->

v0=2.8 (su4)

	General
Description	**Value**
Solution	v0=2.8 (sol6)

Log
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```
2290   5.8322   0.0026048 out 8692 8693 8692    3   2   10 7.8e-15 1.1e-14
2291   5.8348   0.0026048 out 8693 8694 8693    3   2   10 5.7e-15 1.3e-14
2292   5.8374   0.0026048 out 8694 8695 8694    3   2   10 4.2e-15   8e-15
2293    5.84    0.0026048 out 8695 8696 8695    3   2   10 5.1e-16 3.3e-15
2294   5.8426   0.0026048 out 8696 8697 8696    3   2   10   2e-15 4.5e-15
2295   5.8452   0.0026048 out 8697 8698 8697    3   2   10 2.7e-15 6.5e-15
2296   5.8478   0.0026048 out 8698 8699 8698    3   2   10 3.7e-16 1.4e-14
2297   5.8504   0.0026048 out 8699 8700 8699    3   2   10   5e-16   5e-16
2298   5.8531   0.0026048 out 8700 8701 8700    3   2   10 4.6e-15 6.3e-15
2299   5.8557   0.0026048 out 8701 8702 8701    3   2   10 1.1e-16 3.2e-15
2300   5.8583   0.0026048 out 8702 8703 8702    3   2   10 3.8e-15 5.4e-15
2301   5.8609   0.0026048 out 8703 8704 8703    3   2   10 4.6e-15 5.4e-15
2302   5.8635   0.0026048 out 8704 8705 8704    3   2   10 5.1e-15 5.2e-15
2303   5.8661   0.0026048 out 8705 8706 8705    3   2   10 2.3e-15 2.3e-15
2304   5.8687   0.0026048 out 8706 8707 8706    3   2   10 5.4e-15 5.6e-15
2305   5.8713   0.0026048 out 8707 8708 8707    3   2   10 3.9e-15 3.9e-15
2306   5.8739   0.0026048 out 8708 8709 8708    3   2   10 4.3e-15 1.5e-14
2307   5.8765   0.0026048 out 8709 8710 8709    3   2   10 7.3e-16 5.5e-15
2308   5.8791   0.0026048 out 8710 8711 8710    3   2   10 1.8e-15 1.5e-14
2309   5.8817   0.0026048 out 8711 8712 8711    3   2   10 9.3e-16 8.5e-15
2310   5.8843   0.0026048 out 8712 8713 8712    3   2   10 2.5e-15 4.6e-15
2311   5.8869   0.0026048 out 8713 8714 8713    3   2   10 6.1e-16 3.4e-15
2312   5.8895   0.0026048 out 8714 8715 8714    3   2   10 3.7e-15 3.8e-15
2313   5.8921   0.0026048 out 8715 8716 8715    3   2   10 5.6e-15 8.2e-15
2314   5.8947   0.0026048 out 8716 8717 8716    3   2   10 1.5e-15 1.7e-15
2315   5.8973   0.0026048 out 8717 8718 8717    3   2   10 1.2e-15 2.6e-15
2316   5.8999   0.0026048 out 8718 8719 8718    3   2   10 5.8e-15 5.9e-15
2317   5.9025   0.0026048 out 8719 8720 8719    3   2   10 4.7e-16 1.7e-15
2318   5.9051   0.0026048 out 8720 8721 8720    3   2   10 1.7e-15 4.7e-15
2319   5.9078   0.0026048 out 8721 8722 8721    3   2   10 2.7e-16 6.3e-15
2320   5.9104   0.0026048 out 8722 8723 8722    3   2   10 4.6e-15 4.6e-15
2321    5.913   0.0026048 out 8723 8724 8723    3   2   10 2.1e-15 4.6e-15
2322   5.9156   0.0026048 out 8724 8725 8724    3   2   10 3.5e-15 6.6e-15
2323   5.9182   0.0026048 out 8725 8726 8725    3   2   10 3.3e-16 8.3e-15
2324   5.9208   0.0026048 out 8726 8727 8726    3   2   10 5.4e-15 1.1e-14
2325   5.9234   0.0026048 out 8727 8728 8727    3   2   10 9.2e-16 8.8e-15
2326    5.926   0.0026048 out 8728 8729 8728    3   2   10 3.2e-15 3.9e-15
2327   5.9286   0.0026048 out 8729 8730 8729    3   2   10 1.9e-15 8.2e-15
2328   5.9312   0.0026048 out 8730 8731 8730    3   2   10 3.6e-15 5.5e-15
2329   5.9338   0.0026048 out 8731 8732 8731    3   2   10 9.5e-15 1.2e-14
2330   5.9364   0.0026048 out 8732 8733 8732    3   2   10 8.9e-15 1.1e-14
2331    5.939   0.0026048 out 8733 8734 8733    3   2   10 7.3e-15 1.1e-14
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2332   5.9416   0.0026048 out 8734 8735 8734   3   2   10 5.8e-15   6e-15
2333   5.9442   0.0026048 out 8735 8736 8735   3   2   10 3.6e-16   4e-15
2334   5.9468   0.0026048 out 8736 8737 8736   3   2   10 8.7e-15 9.2e-15
2335   5.9494   0.0026048 out 8737 8738 8737   3   2   10 4.5e-15 8.4e-15
2336   5.952    0.0026048 out 8738 8739 8738   3   2   10 4.7e-15   1e-14
2337   5.9546   0.0026048 out 8739 8740 8739   3   2   10 3.4e-15 5.3e-15
2338   5.9572   0.0026048 out 8740 8741 8740   3   2   10 7.5e-16 2.5e-15
2339   5.9598   0.0026048 out 8741 8742 8741   3   2   10 2.4e-15 8.2e-15
2340   5.9625   0.0026048 out 8742 8743 8742   3   2   10   3e-15 8.1e-15
2341   5.9651   0.0026048 out 8743 8744 8743   3   2   10 2.6e-15   3e-15
2342   5.9677   0.0026048 out 8744 8745 8744   3   2   10 1.7e-15 1.2e-14
2343   5.9703   0.0026048 out 8745 8746 8745   3   2   10 3.4e-15 9.7e-15
2344   5.9729   0.0026048 out 8746 8747 8746   3   2   10 3.5e-16 6.2e-15
2345   5.9755   0.0026048 out 8747 8748 8747   3   2   10 2.3e-15 2.3e-15
2346   5.9781   0.0026048 out 8748 8749 8748   3   2   10 1.8e-15 7.7e-15
2347   5.9807   0.0026048 out 8749 8750 8749   3   2   10 1.9e-15 1.2e-14
2348   5.9833   0.0026048 out 8750 8751 8750   3   2   10 9.5e-16   7e-15
2349   5.9859   0.0026048 out 8751 8752 8751   3   2   10 7.2e-15 7.4e-15
2350   5.9885   0.0026048 out 8752 8753 8752   3   2   10 8.9e-15 8.9e-15
2351   5.9911   0.0026048 out 8753 8754 8753   3   2   10   6e-15 6.6e-15
2352   5.9937   0.0026048 out 8754 8755 8754   3   2   10 5.5e-15 5.6e-15
2353   5.9963   0.0026048 out 8755 8756 8755   3   2   10 2.9e-15 4.4e-15
2354   5.9989   0.0026048 out 8756 8757 8756   3   2   10 5.4e-16 4.1e-15
2355   6.0015   0.0026048 out 8757 8758 8757   3   2   10 4.4e-15 4.4e-15
2356   6.0041   0.0026048 out 8758 8759 8758   3   2   10 2.9e-15 6.2e-15
2357   6.0067   0.0026048 out 8759 8760 8759   3   2   10 1.4e-17 1.4e-15
2358   6.0093   0.0026048 out 8760 8761 8760   3   2   10 7.9e-17 7.2e-15
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2363   6.0224   0.0026048 out 8765 8766 8765   3   2   10   5e-16 4.6e-15
2364   6.025    0.0026048 out 8766 8767 8766   3   2   10 2.5e-15 3.1e-15
2365   6.0276   0.0026048 out 8767 8768 8767   3   2   10 1.2e-15 3.1e-15
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2371   6.0432   0.0026048 out 8773 8774 8773   3   2   10 3.8e-15   4e-15
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2373   6.0484   0.0026048 out 8775 8776 8775   3   2   10   3e-15 1.4e-14
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2401   6.1213   0.0026048 out 8803 8804 8803   3   2   10 5.1e-15 6.8e-15
2402   6.124    0.0026048 out 8804 8805 8804   3   2   10 1.8e-15 4.2e-15
2403   6.1266   0.0026048 out 8805 8806 8805   3   2   10 4.8e-15 5.5e-15
2404   6.1292   0.0026048 out 8806 8807 8806   3   2   10 3.1e-15 8.3e-15
2405   6.1318   0.0026048 out 8807 8808 8807   3   2   10 4.8e-17 2.3e-15
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2411   6.1474   0.0026048 out 8813 8814 8813   3   2   10 4.8e-15 5.5e-15
2412   6.15     0.0026048 out 8814 8815 8814   3   2   10 2.4e-15 2.7e-15
2413   6.1526   0.0026048 out 8815 8816 8815   3   2   10   4e-15 7.7e-15
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2416   6.1604   0.0026048 out 8818 8819 8818    3    2    10  1.3e-15  2.1e-15
2417    6.163   0.0026048 out 8819 8820 8819    3    2    10  7.5e-16  1.2e-15
2418   6.1656   0.0026048 out 8820 8821 8820    3    2    10  6.1e-16  3.9e-15
2419   6.1682   0.0026048 out 8821 8822 8821    3    2    10  5.4e-15   6e-15
2420   6.1708   0.0026048 out 8822 8823 8822    3    2    10  1.4e-15  3.6e-15
2421   6.1734   0.0026048 out 8823 8824 8823    3    2    10  3.4e-15  5.1e-15
2422   6.1761   0.0026048 out 8824 8825 8824    3    2    10  3.1e-15  4.5e-15
2423   6.1787   0.0026048 out 8825 8826 8825    3    2    10  7.8e-15   1e-14
2424   6.1813   0.0026048 out 8826 8827 8826    3    2    10  5.8e-16  2.9e-15
2425   6.1839   0.0026048 out 8827 8828 8827    3    2    10  6.3e-16  6.3e-15
2426   6.1865   0.0026048 out 8828 8829 8828    3    2    10  2.5e-15  4.8e-15
2427   6.1891   0.0026048 out 8829 8830 8829    3    2    10  3.4e-15  4.7e-15
2428   6.1917   0.0026048 out 8830 8831 8830    3    2    10  1.4e-15   2e-15
2429   6.1943   0.0026048 out 8831 8832 8831    3    2    10  4.1e-15  4.1e-15
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2431   6.1995   0.0026048 out 8833 8834 8833    3    2    10  6.9e-16  6.5e-15
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2433   6.2047   0.0026048 out 8835 8836 8835    3    2    10  1.6e-15   6e-15
2434   6.2073   0.0026048 out 8836 8837 8836    3    2    10  1.2e-15  1.3e-15
2435   6.2099   0.0026048 out 8837 8838 8837    3    2    10  4.4e-15  4.7e-15
2436   6.2125   0.0026048 out 8838 8839 8838    3    2    10  1.1e-15  1.5e-15
2437   6.2151   0.0026048 out 8839 8840 8839    3    2    10  1.2e-15  1.6e-15
2438   6.2177   0.0026048 out 8840 8841 8840    3    2    10  2.1e-16  4.6e-15
2439   6.2203   0.0026048 out 8841 8842 8841    3    2    10  1.5e-15  3.6e-15
2440   6.2229   0.0026048 out 8842 8843 8842    3    2    10    3e-15  6.7e-15
2441   6.2255   0.0026048 out 8843 8844 8843    3    2    10  1.1e-15  2.3e-15
2442   6.2281   0.0026048 out 8844 8845 8844    3    2    10  3.9e-15  4.5e-15
2443   6.2308   0.0026048 out 8845 8846 8845    3    2    10  1.2e-15  3.7e-15
2444   6.2334   0.0026048 out 8846 8847 8846    3    2    10  1.3e-15  4.4e-15
2445    6.236   0.0026048 out 8847 8848 8847    3    2    10  7.1e-17  5.2e-15
2446   6.2386   0.0026048 out 8848 8849 8848    3    2    10  1.3e-16  4.8e-16
2447   6.2412   0.0026048 out 8849 8850 8849    3    2    10    1e-15  5.2e-15
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2451   6.2516   0.0026048 out 8853 8854 8853    3    2    10  2.7e-15   2e-15
2452   6.2542   0.0026048 out 8854 8855 8854    3    2    10  7.2e-16  9.3e-16
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2455    6.262   0.0026048 out 8857 8858 8857    3    2    10  1.3e-15  5.5e-16
2456   6.2646   0.0026048 out 8858 8859 8858    3    2    10  1.4e-15  6.3e-16
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2458   6.2698   0.0026048 out 8860 8861 8860    3    2    10    8e-16  7.2e-16
2459   6.2724   0.0026048 out 8861 8862 8861    3    2    10  9.8e-17  1.1e-15
2460    6.275   0.0026048 out 8866 8867 8866    3    2    10  3.7e-16  2.2e-18
2461   6.2776   0.0026048 out 8868 8869 8868    3    2    10  2.1e-16  5.3e-18
2462   6.2802   0.0026048 out 8870 8871 8870    3    2    10  2.7e-15  5.8e-18
2463   6.2828   0.0026048 out 8873 8874 8873    3    2    10  2.4e-15  7.7e-18
2464   6.2855   0.0026048 out 8875 8876 8875    3    2    10  2.5e-15  5.8e-18
2465   6.2881   0.0026048 out 8883 8884 8883    3    2    10  7.8e-16  1.2e-18
2466   6.2907   0.0026048 out 8885 8886 8885    3    2    10  1.7e-15   4e-18
2467   6.2933   0.0026048 out 8894 8895 8894    3    2    10  2.8e-17  1.2e-18
2468   6.2959   0.0026048 out 8896 8897 8896    3    2    10  4.3e-16  1.2e-18
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2470   6.3011   0.0026048 out 8921 8922 8921    3    2    10  4.6e-16  2.3e-18
2471   6.3037   0.0026048 out 8947 8948 8947    3    2    10  4.6e-16   7e-19
2472   6.3063   0.0026048 out 8963 8964 8963    3    2    10  3.1e-16  5.4e-19
2473   6.3089   0.0026048 out 8973 8974 8973    3    2    10  2.4e-16  4.3e-19
2474   6.3115   0.0026048 out 8976 8977 8976    3    2    10  2.2e-16  2.1e-19
2475   6.3141   0.0026048 out 8982 8983 8982    3    2    10  5.7e-17  5.7e-20
2476   6.3167   0.0026048 out 8987 8988 8987    3    2    10  3.5e-17  6.4e-20
2477   6.3193   0.0026048 out 8992 8993 8992    3    2    10  5.1e-17  8.3e-20
2478   6.3219   0.0026048 out 8996 8997 8996    3    2    10    2e-17  3.1e-20
2479   6.3245   0.0026048 out 9000 9001 9000    3    2    10  1.7e-17  3.9e-20
2480   6.3271   0.0026048 out 9004 9005 9004    3    2    10  2.3e-17  1.8e-20
2481   6.3297   0.0026048 out 9008 9009 9008    3    2    10  4.6e-17  3.5e-20
2482   6.3323   0.0026048 out 9012 9013 9012    3    2    10  3.9e-17  3.6e-20
2483   6.3349   0.0026048 out 9016 9017 9016    3    2    10    8e-18  2.6e-20
2484   6.3375   0.0026048 out 9020 9021 9020    3    2    10  9.7e-18  7.4e-21
2485   6.3402   0.0026048 out 9024 9025 9024    3    2    10  8.8e-18  8.5e-21
2486   6.3428   0.0026048 out 9028 9029 9028    3    2    10  8.8e-18  6.3e-21
2487   6.3454   0.0026048 out 9032 9033 9032    3    2    10  5.4e-18  6.3e-21
2488    6.348   0.0026048 out 9036 9037 9036    3    2    10    1e-17  6.8e-21
2489   6.3506   0.0026048 out 9040 9041 9040    3    2    10  7.7e-18  4.5e-21
2490   6.3532   0.0026048 out 9044 9045 9044    3    2    10  1.3e-21  1.8e-21
2491   6.3558   0.0026048 out 9048 9049 9048    3    2    10  1.8e-18  1.5e-21
2492   6.3584   0.0026048 out 9052 9053 9052    3    2    10  6.5e-18  4.8e-21
2493    6.361   0.0026048 out 9056 9057 9056    3    2    10  2.9e-18  1.8e-21
2494   6.3636   0.0026048 out 9060 9061 9060    3    2    10  1.5e-18  2.1e-21
2495   6.3662   0.0026048 out 9064 9065 9064    3    2    10  7.4e-19  1.1e-21
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2497    6.3714   0.0026048 out 9072 9073 9072    3    2    10 4.2e-18  2.4e-21
2498    6.374    0.0026048 out 9076 9077 9076    3    2    10   3e-18  2.1e-21
2499    6.3766   0.0026048 out 9080 9081 9080    3    2    10 2.1e-18  1.2e-21
2500    6.3792   0.0026048 out 9084 9085 9084    3    2    10 2.4e-18  2.1e-21
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2502    6.3844   0.0026048 out 9092 9093 9092    3    2    10 2.1e-18  2.7e-21
2503    6.387    0.0026048 out 9096 9097 9096    3    2    10 1.7e-18  1.4e-21
2504    6.3896   0.0026048 out 9100 9101 9100    3    2    10 2.2e-18  1.3e-21
2505    6.3923   0.0026048 out 9104 9105 9104    3    2    10 4.5e-19  5.4e-22
2506    6.3949   0.0026048 out 9108 9109 9108    3    2    10 1.3e-18  8.8e-22
2507    6.3975   0.0026048 out 9112 9113 9112    3    2    10 4.4e-22  5.9e-22
2508    6.4001   0.0026048 out 9116 9117 9116    3    2    10 6.8e-19  4.5e-22
2509    6.4027   0.0026048 out 9120 9121 9120    3    2    10 5.6e-19  6.6e-22
2510    6.4053   0.0026048 out 9124 9125 9124    3    2    10 3.6e-22  4.8e-22
2511    6.4079   0.0026048 out 9128 9129 9128    3    2    10 1.7e-18  1.4e-21
2512    6.4105   0.0026048 out 9132 9133 9132    3    2    10 1.1e-18  7.9e-22
2513    6.4131   0.0026048 out 9136 9137 9136    3    2    10 5.1e-19  9.6e-22
2514    6.4157   0.0026048 out 9140 9141 9140    3    2    10 6.4e-19  4.5e-22
2515    6.4183   0.0026048 out 9144 9145 9144    3    2    10 5.9e-19  4.1e-22
2516    6.4209   0.0026048 out 9148 9149 9148    3    2    10 3.1e-19  3.4e-22
2517    6.4235   0.0026048 out 9152 9153 9152    3    2    10 1.2e-18  1.1e-21
2518    6.4261   0.0026048 out 9156 9157 9156    3    2    10   1e-18  9.9e-22
2519    6.4287   0.0026048 out 9160 9161 9160    3    2    10 8.5e-19  4.3e-22
2520    6.4313   0.0026048 out 9164 9165 9164    3    2    10 2.3e-18  2.1e-21
2521    6.4339   0.0026048 out 9168 9169 9168    3    2    10 1.2e-18  8.4e-22
2522    6.4365   0.0026048 out 9172 9173 9172    3    2    10 3.5e-19  4.3e-22
2523    6.4391   0.0026048 out 9176 9177 9176    3    2    10 3.3e-19  4.4e-22
2524    6.4417   0.0026048 out 9180 9181 9180    3    2    10 7.6e-19  6.1e-22
2525    6.4443   0.0026048 out 9184 9185 9184    3    2    10 1.6e-18   9e-22
2526    6.447    0.0026048 out 9188 9189 9188    3    2    10   6e-19  7.9e-22
2527    6.4496   0.0026048 out 9192 9193 9192    3    2    10 1.1e-18  5.2e-22
2528    6.4522   0.0026048 out 9196 9197 9196    3    2    10 9.5e-19  4.5e-22
2529    6.4548   0.0026048 out 9200 9201 9200    3    2    10 1.9e-18  8.6e-22
2530    6.4574   0.0026048 out 9204 9205 9204    3    2    10 1.4e-18  5.7e-22
2531    6.46     0.0026048 out 9208 9209 9208    3    2    10 1.6e-18  1.3e-21
2532    6.4626   0.0026048 out 9212 9213 9212    3    2    10 1.4e-18  9.3e-22
2533    6.4652   0.0026048 out 9216 9217 9216    3    2    10 1.7e-18  9.1e-22
2534    6.4678   0.0026048 out 9220 9221 9220    3    2    10 1.1e-18  1.1e-21
2535    6.4704   0.0026048 out 9224 9225 9224    3    2    10 2.1e-18  1.5e-21
2536    6.473    0.0026048 out 9228 9229 9228    3    2    10 3.9e-18  1.6e-21
2537    6.4756   0.0026048 out 9232 9233 9232    3    2    10 2.2e-18   2e-21
2538    6.4782   0.0026048 out 9236 9237 9236    3    2    10   4e-18  1.7e-21
2539    6.4808   0.0026048 out 9240 9241 9240    3    2    10 8.1e-18  2.8e-21
2540    6.4834   0.0026048 out 9244 9245 9244    3    2    10 1.3e-17  4.7e-21
2541    6.486    0.0026048 out 9249 9250 9249    3    2    10 9.6e-18  3.8e-21
2542    6.4886   0.0026048 out 9254 9255 9254    3    2    10 1.9e-18  3.1e-21
2543    6.4912   0.0026048 out 9259 9260 9259    3    2    10 5.3e-18  5.2e-21
2544    6.4938   0.0026048 out 9266 9267 9266    3    2    10 2.5e-17  1.8e-20
2545    6.4964   0.0026048 out 9280 9281 9280    3    2    10 1.2e-16  4.5e-20
2546    6.499    0.0026048 out 9292 9293 9292    3    2    10 4.7e-15   2e-18
2547    6.5017   0.0026048 out 9301 9302 9301    3    2    10 7.8e-16  4.2e-18
2548    6.5043   0.0026048 out 9314 9315 9314    3    2    10 8.7e-15  2.9e-18
2549    6.5069   0.0026048 out 9325 9326 9325    3    2    10   9e-15  2.2e-18
2550    6.5095   0.0026048 out 9331 9332 9331    2    2    10 1.4e-14  3.4e-18
2551    6.5121   0.0026048 out 9339 9340 9339    2    2    10   5e-16  1.7e-18
2552    6.5147   0.0026048 out 9346 9347 9346    2    2    10 9.3e-15  2.6e-18
2553    6.5173   0.0026048 out 9352 9353 9352    2    2    10 2.1e-15  2.5e-18
2554    6.5199   0.0026048 out 9357 9358 9357    2    2    10 8.4e-15  1.3e-18
2555    6.5225   0.0026048 out 9361 9362 9361    2    2    10 1.3e-14  2.3e-18
2556    6.5251   0.0026048 out 9365 9366 9365    2    2    10 2.1e-14  2.9e-18
2557    6.5277   0.0026048 out 9368 9369 9368    2    2    10 4.7e-15  2.5e-18
2558    6.5303   0.0026048 out 9371 9372 9371    3    2    10 5.2e-15  9.7e-19
2559    6.5329   0.0026048 out 9374 9375 9374    3    2    10 6.9e-15  2.7e-18
2560    6.5355   0.0026048 out 9376 9377 9376    3    2    10   1e-14  2.1e-18
2561    6.5381   0.0026048 out 9378 9379 9378    3    2    10 6.6e-15  9.2e-19
2562    6.5407   0.0026048 out 9380 9381 9380    3    2    10   2e-14  2.7e-18
2563    6.5433   0.0026048 out 9382 9383 9382    3    2    10 5.9e-15  1.1e-18
2564    6.5459   0.0026048 out 9384 9385 9384    3    2    10 1.3e-14   2e-18
2565    6.5485   0.0026048 out 9387 9388 9387    3    2    10 2.9e-15  7.1e-19
2566    6.5511   0.0026048 out 9389 9390 9389    3    2    10 1.4e-14  1.9e-18
2567    6.5538   0.0026048 out 9392 9393 9392    3    2    10 5.4e-15  5.5e-19
2568    6.5564   0.0026048 out 9394 9395 9394    3    2    10 3.6e-15  7.7e-19
2569    6.559    0.0026048 out 9397 9398 9397    3    2    10 1.3e-14  1.1e-18
2570    6.5616   0.0026048 out 9399 9400 9399    3    2    10 4.3e-14  3.7e-18
2571    6.5642   0.0026048 out 9400 9401 9400    3    2    10 4.5e-13  3.9e-13
2572    6.5668   0.0026048 out 9402 9403 9402    3    2    10 2.2e-14  1.5e-18
2573    6.5694   0.0026048 out 9404 9405 9404    3    2    10 6.1e-15  7.1e-19
2574    6.572    0.0026048 out 9406 9407 9406    3    2    10 3.4e-15  3.5e-19
2575    6.5746   0.0026048 out 9408 9409 9408    3    2    10 7.1e-15  1.4e-18
2576    6.5772   0.0026048 out 9410 9411 9410    3    2    10 1.6e-14  2.1e-18
2577    6.5798   0.0026048 out 9412 9413 9412    3    2    10 4.2e-14  2.9e-18
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2578    6.5824   0.0026048 out 9414 9415 9414   3   2   10 1.5e-15 1.1e-19
2579     6.585  0.0026048 out 9416 9417 9416   3   2   10 2.6e-15 1.7e-19
2580    6.5876   0.0026048 out 9418 9419 9418   3   2   10 7.5e-15 5.3e-19
2581    6.5902   0.0026048 out 9420 9421 9420   3   2   10 1.4e-14 9.9e-19
2582    6.5928   0.0026048 out 9422 9423 9422   3   2   10 2.9e-14 5.1e-18
2583    6.5954   0.0026048 out 9424 9425 9424   3   2   10 1.3e-14 5.5e-18
2584     6.598  0.0026048 out 9426 9427 9426   3   2   10 3.3e-14 5.4e-18
2585    6.6006   0.0026048 out 9428 9429 9428   3   2   10 5.1e-15 5.4e-19
2586    6.6032   0.0026048 out 9430 9431 9430   3   2   10 1.5e-14 4.7e-18
2587    6.6058   0.0026048 out 9433 9434 9433   3   2   10   3e-15 3.2e-19
2588    6.6085   0.0026048 out 9435 9436 9435   3   2   10   1e-15 7.6e-18
2589    6.6111   0.0026048 out 9438 9439 9438   3   2   10 7.4e-15 2.5e-18
2590    6.6137   0.0026048 out 9440 9441 9440   3   2   10 2.5e-14 4.3e-18
2591    6.6163   0.0026048 out 9443 9444 9443   3   2   10   1e-14 1.5e-18
2592    6.6189   0.0026048 out 9445 9446 9445   3   2   10 1.3e-15 1.5e-18
2593    6.6215   0.0026048 out 9448 9449 9448   3   2   10 1.6e-15 5.2e-19
2594    6.6241   0.0026048 out 9450 9451 9450   3   2   10 6.1e-15 1.4e-18
2595    6.6267   0.0026048 out 9453 9454 9453   3   2   10 2.7e-15 6.6e-19
2596    6.6293   0.0026048 out 9455 9456 9455   3   2   10 1.2e-14 1.9e-18
2597    6.6319   0.0026048 out 9458 9459 9458   3   2   10 2.2e-15 8.7e-19
2598    6.6345   0.0026048 out 9460 9461 9460   3   2   10 1.9e-15 1.7e-18
2599    6.6371   0.0026048 out 9463 9464 9463   3   2   10 4.7e-15 8.8e-19
2600    6.6397   0.0026048 out 9465 9466 9465   3   2   10 2.8e-15 1.3e-18
2601    6.6423   0.0026048 out 9468 9469 9468   3   2   10 5.8e-15 1.4e-18
2602    6.6449   0.0026048 out 9470 9471 9470   3   2   10 4.4e-15 1.7e-18
2603    6.6475   0.0026048 out 9474 9475 9474   3   2   10 2.1e-15 1.4e-18
2604    6.6501   0.0026048 out 9476 9477 9476   3   2   10 4.8e-15 1.5e-18
2605    6.6527   0.0026048 out 9479 9480 9479   3   2   10 2.5e-15 3.4e-18
2606    6.6553   0.0026048 out 9481 9482 9481   3   2   10 4.7e-15 1.8e-18
2607    6.6579   0.0026048 out 9485 9486 9485   3   2   10   8e-15 2.8e-18
2608    6.6605   0.0026048 out 9487 9488 9487   3   2   10 1.8e-15 2.4e-18
2609    6.6632   0.0026048 out 9490 9491 9490   3   2   10   7e-15 2.1e-18
2610    6.6658   0.0026048 out 9492 9493 9492   3   2   10 8.3e-15   3e-18
2611    6.6684   0.0026048 out 9496 9497 9496   3   2   10 1.4e-14 5.3e-18
2612     6.671  0.0026048 out 9498 9499 9498   3   2   10 6.3e-15 2.2e-18
2613    6.6736   0.0026048 out 9502 9503 9502   3   2   10 3.3e-15 1.3e-18
2614    6.6762   0.0026048 out 9504 9505 9504   3   2   10 1.7e-15 7.6e-19
2615    6.6788   0.0026048 out 9508 9509 9508   3   2   10 1.1e-14 4.3e-18
2616    6.6814   0.0026048 out 9510 9511 9510   3   2   10 5.6e-16 4.6e-18
2617    6.684   0.0026048 out 9515 9516 9515   3   2   10 1.9e-15 1.4e-18
2618    6.6866   0.0026048 out 9517 9518 9517   3   2   10   1e-14 3.8e-18
2619    6.6892   0.0026048 out 9522 9523 9522   3   2   10 1.7e-15   7e-19
2620    6.6918   0.0026048 out 9524 9525 9524   3   2   10 7.3e-15 3.7e-18
2621    6.6944   0.0026048 out 9532 9533 9532   3   2   10 4.5e-15 4.5e-18
2622     6.697  0.0026048 out 9534 9535 9534   3   2   10 3.5e-16   1e-18
2623    6.6996   0.0026048 out 9548 9549 9548   3   2   10 5.6e-16 7.8e-19
2624    6.7022   0.0026048 out 9564 9565 9564   3   2   10 3.6e-15 2.2e-18
2625    6.7048   0.0026048 out 9598 9599 9598   3   2   10 1.2e-15 1.3e-18
2626    6.7055   0.00065121     9665 9666 9665   3   2   11 1.1e-15 7.7e-18
2627    6.7065   0.00097681     9695 9696 9695   3   2   11 1.3e-15 3.6e-18
2628    6.7074   0.00097681 out 9726 9727 9726   3   2   11 1.4e-16 4.6e-18
2629    6.7087   0.0013024     9769 9770 9769   3   2   11 1.2e-15 3.1e-18
2630     6.71   0.0013024 out 9800 9801 9800   3   2   11 1.7e-16 3.7e-18
2631    6.7126   0.0026048 out 9833 9834 9833   3   2   11 3.1e-16 4.3e-19
2632    6.7152   0.0026048 out 9843 9844 9843   3   2   11   1e-16 6.3e-20
2633    6.7179   0.0026048 out 9845 9846 9845   3   2   11 3.7e-17 6.4e-20
2634    6.7205   0.0026048 out 9854 9855 9854   3   2   11 9.4e-17 8.7e-20
2635    6.7231   0.0026048 out 9862 9863 9862   3   2   11 2.8e-17 3.7e-20
2636    6.7257   0.0026048 out 9868 9869 9868   3   2   11 3.1e-17 2.3e-20
2637    6.7283   0.0026048 out 9874 9875 9874   3   2   11 2.4e-17 5.3e-20
2638    6.7309   0.0026048 out 9879 9880 9879   3   2   11 3.9e-17 3.6e-20
2639    6.7335   0.0026048 out 9884 9885 9884   3   2   11 5.4e-18 1.2e-20
```
Time-stepping completed.
Solution time: 606 s. (10 minutes, 6 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

v0=3.1 (su5)

	General
Description	**Value**
Solution	v0=3.1 (sol7)

Log
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```
2304    5.1648   0.0024736 out 7311 7312 7311   1   29   22   3e-15 4.9e-19
2305    5.1673   0.0024736 out 7316 7317 7316   1   29   22 9.2e-15 2.3e-18
2306    5.1697   0.0024736 out 7321 7322 7321   1   29   22 2.6e-15 1.2e-18
2307    5.1722   0.0024736 out 7327 7328 7327   1   29   22   3e-16 1.4e-18
2308    5.1747   0.0024736 out 7333 7334 7333   1   29   22 1.6e-14 2.1e-18
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2309	5.1772	0.0024736	out	7339 7340 7339	1	29	22	1.2e-14	2.4e-18
2310	5.1796	0.0024736	out	7345 7346 7345	1	29	22	2.6e-15	1.1e-18
2311	5.1821	0.0024736	out	7352 7353 7352	1	29	22	2.7e-15	1.1e-18
2312	5.1846	0.0024736	out	7359 7360 7359	1	29	22	1.2e-14	2.1e-18
2313	5.1871	0.0024736	out	7366 7367 7366	1	29	22	1.3e-14	2e-18
2314	5.1895	0.0024736	out	7374 7375 7374	1	29	22	2.5e-15	1.2e-18
2315	5.192	0.0024736	out	7382 7383 7382	1	29	22	9.2e-15	2.7e-18
2316	5.1945	0.0024736	out	7391 7392 7391	1	29	22	5.4e-15	1.5e-18
2317	5.197	0.0024736	out	7401 7402 7401	1	29	22	1.5e-14	2.1e-18
2318	5.1994	0.0024736	out	7412 7413 7412	1	29	22	2.3e-14	3.3e-18
2319	5.2019	0.0024736	out	7424 7425 7424	1	29	22	7.6e-15	1.9e-18
2320	5.2044	0.0024736	out	7438 7439 7438	1	29	22	7.1e-15	1.1e-18
2321	5.2068	0.0024736	out	7454 7455 7454	1	29	22	8.5e-17	2.1e-18
2322	5.2093	0.0024736	out	7474 7475 7474	1	29	22	7e-16	3.4e-19
2323	5.2118	0.0024736	out	7500 7501 7500	1	29	22	1.4e-14	2.2e-18
2324	5.2143	0.0024736	out	7538 7539 7538	1	29	22	1.4e-15	9e-19
2325	5.2149	0.00061839		7611 7612 7611	1	29	23	1.7e-16	3.5e-18
2326	5.2158	0.00092759		7645 7646 7645	1	29	23	6.5e-16	3.5e-18
2327	5.2167	0.00092759	out	7686 7687 7686	1	29	23	2.4e-16	5.4e-18
2328	5.2171	0.0003092		7754 7755 7754	1	29	24	7.7e-17	7.2e-18
2329	5.2177	0.00061839		7789 7790 7789	1	29	24	1.8e-15	4.3e-18
2330	5.2184	0.00077299		7835 7836 7835	1	29	24	4.4e-16	8e-19
2331	5.2192	0.00077299	out	7881 7882 7881	1	29	24	2.1e-16	1.7e-18
2332	5.2195	0.0003092		7949 7950 7949	1	29	25	8.6e-17	3e-18
2333	5.2201	0.00061839		7983 7984 7983	1	29	25	1.8e-16	1.3e-18
2334	5.2209	0.00077299		8020 8021 8020	1	29	25	4.8e-16	7.9e-19
2335	5.2217	0.00077299	out	8052 8053 8052	1	29	25	4.3e-16	1.1e-16
2336	5.2229	0.0012368		8093 8094 8093	1	29	25	8.8e-16	7.2e-19
2337	5.2242	0.0012368	out	8126 8127 8126	1	29	25	1.1e-16	8e-20
2338	5.2266	0.0024736	out	8170 8171 8170	1	29	25	1.2e-16	1.1e-19
2339	5.2291	0.0024736	out	8200 8201 8200	1	29	25	1.9e-16	1.2e-19
2340	5.2316	0.0024736	out	8223 8224 8223	1	29	25	4.5e-16	8.1e-20
2341	5.2341	0.0024736	out	8241 8242 8241	1	29	25	3.1e-16	6e-20
2342	5.2365	0.0024736	out	8256 8257 8256	1	29	25	1.7e-16	4.3e-20
2343	5.239	0.0024736	out	8269 8270 8269	1	29	25	4.6e-17	9.5e-21
2344	5.2415	0.0024736	out	8281 8282 8281	1	29	25	8.5e-17	1.6e-20
2345	5.244	0.0024736	out	8291 8292 8291	1	29	25	6.3e-17	2.1e-20
2346	5.2464	0.0024736	out	8300 8301 8300	1	29	25	3.3e-17	1.3e-20
2347	5.2489	0.0024736	out	8309 8310 8309	1	29	25	7.1e-17	1.4e-20
2348	5.2514	0.0024736	out	8317 8318 8317	1	29	25	2.8e-17	9.2e-21
2349	5.2538	0.0024736	out	8325 8326 8325	1	29	25	5.9e-17	1.2e-20
2350	5.2563	0.0024736	out	8332 8333 8332	1	29	25	4.9e-18	5.5e-21
2351	5.2588	0.0024736	out	8339 8340 8339	1	29	25	4.3e-17	1.2e-20
2352	5.2613	0.0024736	out	8346 8347 8346	1	29	25	2.1e-17	5.9e-21
2353	5.2637	0.0024736	out	8353 8354 8353	1	29	25	2.8e-17	6.6e-21
2354	5.2662	0.0024736	out	8359 8360 8359	1	29	25	4e-17	9.2e-21
2355	5.2687	0.0024736	out	8365 8366 8365	1	29	25	2.9e-17	8.8e-21
2356	5.2712	0.0024736	out	8371 8372 8371	1	29	25	6.5e-18	3.9e-21
2357	5.2736	0.0024736	out	8377 8378 8377	1	29	25	5.7e-18	4e-21
2358	5.2761	0.0024736	out	8383 8384 8383	1	29	25	4.2e-18	3.9e-21
2359	5.2786	0.0024736	out	8389 8390 8389	1	29	25	4.4e-18	1.5e-21
2360	5.2811	0.0024736	out	8395 8396 8395	1	29	25	1.5e-17	4.3e-21
2361	5.2835	0.0024736	out	8400 8401 8400	1	29	25	9.3e-18	1.8e-21
2362	5.286	0.0024736	out	8405 8406 8405	1	29	25	9e-18	1.9e-21
2363	5.2885	0.0024736	out	8410 8411 8410	1	29	25	6.2e-18	1.5e-21
2364	5.291	0.0024736	out	8415 8416 8415	1	29	25	8.7e-18	2.2e-21
2365	5.2934	0.0024736	out	8420 8421 8420	1	29	25	6.3e-18	1.6e-21
2366	5.2959	0.0024736	out	8425 8426 8425	1	29	25	4e-18	2.9e-21
2367	5.2984	0.0024736	out	8430 8431 8430	1	29	25	5.7e-18	2.1e-21
2368	5.3008	0.0024736	out	8435 8436 8435	1	29	25	2.1e-18	1e-21
2369	5.3033	0.0024736	out	8440 8441 8440	1	29	25	4.8e-18	1e-21
2370	5.3058	0.0024736	out	8445 8446 8445	1	29	25	1.2e-18	1e-21
2371	5.3083	0.0024736	out	8450 8451 8450	1	29	25	1.6e-18	8e-22
2372	5.3107	0.0024736	out	8455 8456 8455	1	29	25	1.8e-18	8e-22
2373	5.3132	0.0024736	out	8460 8461 8460	1	29	25	3.5e-18	1.5e-21
2374	5.3157	0.0024736	out	8465 8466 8465	1	29	25	1.6e-18	4.5e-22
2375	5.3182	0.0024736	out	8470 8471 8470	1	29	25	1.7e-18	5.3e-22
2376	5.3206	0.0024736	out	8475 8476 8475	1	29	25	2.2e-18	6.4e-22
2377	5.3231	0.0024736	out	8480 8481 8480	1	29	25	2.2e-18	8.3e-22
2378	5.3256	0.0024736	out	8484 8485 8484	1	29	25	4.3e-18	1.1e-21
2379	5.3281	0.0024736	out	8488 8489 8488	1	29	25	4.3e-18	9.6e-22
2380	5.3305	0.0024736	out	8492 8493 8492	1	29	25	2.9e-18	1e-21
2381	5.333	0.0024736	out	8496 8497 8496	1	29	25	3.7e-18	8.4e-22
2382	5.3355	0.0024736	out	8500 8501 8500	1	29	25	1.2e-18	5.9e-22
2383	5.3379	0.0024736	out	8502 8503 8502	1	29	25	1.7e-17	6.2e-21
2384	5.3404	0.0024736	out	8507 8508 8507	1	29	25	1.2e-18	1.3e-21
2385	5.3429	0.0024736	out	8511 8512 8511	1	29	25	1e-18	3e-22
2386	5.3454	0.0024736	out	8515 8516 8515	1	29	25	4.4e-18	9.8e-22
2387	5.3478	0.0024736	out	8520 8521 8520	1	29	25	3.5e-18	9.8e-22
2388	5.3503	0.0024736	out	8525 8526 8525	1	29	25	2.8e-18	5.4e-22
2389	5.3528	0.0024736	out	8530 8531 8530	1	29	25	1.2e-18	4.5e-22
2390	5.3553	0.0024736	out	8535 8536 8535	1	29	25	4e-18	8.5e-22

2391	5.3577	0.0024736	out	8540 8541 8540	1	29	25	2e-18	6.5e-22
2392	5.3602	0.0024736	out	8545 8546 8545	1	29	25	1.6e-18	4e-22
2393	5.3627	0.0024736	out	8550 8551 8550	1	29	25	3.9e-18	1.4e-21
2394	5.3652	0.0024736	out	8555 8556 8555	1	29	25	9.1e-18	2.7e-21
2395	5.3676	0.0024736	out	8560 8561 8560	1	29	25	6e-18	1.7e-21
2396	5.3701	0.0024736	out	8565 8566 8565	1	29	25	2.4e-18	1e-21
2397	5.3726	0.0024736	out	8570 8571 8570	1	29	25	5e-18	1.7e-21
2398	5.3751	0.0024736	out	8575 8576 8575	1	29	25	2.6e-18	1.8e-21
2399	5.3775	0.0024736	out	8580 8581 8580	1	29	25	2.5e-18	1.4e-21
2400	5.38	0.0024736	out	8585 8586 8585	1	29	25	3.8e-18	1e-21
2401	5.3825	0.0024736	out	8590 8591 8590	1	29	25	1.6e-18	1.1e-21
2402	5.3849	0.0024736	out	8595 8596 8595	1	29	25	1.4e-17	3.4e-21
2403	5.3874	0.0024736	out	8600 8601 8600	1	29	25	7e-18	2.3e-21
2404	5.3899	0.0024736	out	8606 8607 8606	1	29	25	1.4e-17	2.7e-21
2405	5.3924	0.0024736	out	8612 8613 8612	1	29	25	5.6e-18	2.8e-21
2406	5.3948	0.0024736	out	8618 8619 8618	1	29	25	2.2e-18	3e-21
2407	5.3973	0.0024736	out	8624 8625 8624	1	29	25	7.9e-18	6e-21
2408	5.3998	0.0024736	out	8631 8632 8631	1	29	25	1.4e-17	8.6e-21
2409	5.4023	0.0024736	out	8638 8639 8638	1	29	25	1.8e-17	5e-21
2410	5.4047	0.0024736	out	8646 8647 8646	1	29	25	2.1e-17	6.5e-21
2411	5.4072	0.0024736	out	8657 8658 8657	1	29	25	0	0
2412	5.4097	0.0024736	out	8701 8702 8701	1	29	25	2.5e-16	5.6e-19
2413	5.4122	0.0024736	out	8706 8707 8706	1	29	25	1.2e-15	2.5e-18
2414	5.4146	0.0024736	out	8708 8709 8708	1	29	25	6.8e-15	1e-17
2415	5.4171	0.0024736	out	8710 8711 8710	1	29	25	2.1e-15	5.3e-18
2416	5.4196	0.0024736	out	8712 8713 8712	1	29	25	9.1e-16	1.6e-17
2417	5.422	0.0024736	out	8715 8716 8715	1	29	25	1.3e-15	7.8e-18
2418	5.4245	0.0024736	out	8717 8718 8717	1	29	25	2.5e-15	1.1e-17
2419	5.427	0.0024736	out	8719 8720 8719	1	29	25	1.9e-15	1.1e-17
2420	5.4295	0.0024736	out	8721 8722 8721	1	29	25	2.2e-15	4.6e-17
2421	5.4319	0.0024736	out	8723 8724 8723	1	29	25	4.4e-15	2.9e-17
2422	5.4344	0.0024736	out	8725 8726 8725	1	29	25	4.9e-15	3.6e-17
2423	5.4369	0.0024736	out	8727 8728 8727	1	29	25	5.5e-15	5.6e-17
2424	5.4394	0.0024736	out	8729 8730 8729	1	29	25	9.3e-16	5e-17
2425	5.4418	0.0024736	out	8731 8732 8731	1	29	25	1.2e-14	1.2e-16
2426	5.4443	0.0024736	out	8733 8734 8733	1	29	25	1.1e-14	1.9e-16
2427	5.4468	0.0024736	out	8735 8736 8735	1	29	25	3.1e-15	1.1e-16
2428	5.4493	0.0024736	out	8737 8738 8737	1	29	25	2.6e-15	2.6e-16
2429	5.4517	0.0024736	out	8739 8740 8739	1	29	25	1.6e-15	1.1e-16
2430	5.4542	0.0024736	out	8741 8742 8741	1	29	25	8.3e-15	9.4e-16
2431	5.4567	0.0024736	out	8743 8744 8743	1	29	25	1.4e-15	1.2e-15
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2433	5.4616	0.0024736	out	8747 8748 8747	1	29	25	3.1e-15	1.9e-16
2434	5.4641	0.0024736	out	8749 8750 8749	1	29	25	1.9e-15	9.7e-17
2435	5.4666	0.0024736	out	8751 8752 8751	1	29	25	5.8e-15	1.2e-16
2436	5.469	0.0024736	out	8753 8754 8753	1	29	25	2.5e-15	5.9e-17
2437	5.4715	0.0024736	out	8755 8756 8755	1	29	25	1.9e-15	1.2e-16
2438	5.474	0.0024736	out	8757 8758 8757	1	29	25	8.5e-15	1.1e-16
2439	5.4765	0.0024736	out	8759 8760 8759	1	29	25	6.6e-16	1.5e-17
2440	5.4789	0.0024736	out	8761 8762 8761	1	29	25	9.4e-17	5.6e-17
2441	5.4814	0.0024736	out	8763 8764 8763	1	29	25	4.7e-15	4.1e-17
2442	5.4839	0.0024736	out	8765 8766 8765	1	29	25	1.3e-15	1.7e-17
2443	5.4864	0.0024736	out	8767 8768 8767	1	29	25	2.9e-16	4.4e-17
2444	5.4888	0.0024736	out	8769 8770 8769	1	29	25	1.6e-15	1.6e-17
2445	5.4913	0.0024736	out	8771 8772 8771	1	29	25	6.3e-15	3.8e-17
2446	5.4938	0.0024736	out	8773 8774 8773	1	29	25	1.3e-14	6.8e-17
2447	5.4963	0.0024736	out	8775 8776 8775	1	29	25	1e-14	5.9e-17
2448	5.4987	0.0024736	out	8777 8778 8777	1	29	25	1.1e-14	5.7e-17
2449	5.5012	0.0024736	out	8779 8780 8779	1	29	25	3.3e-15	1.5e-17
2450	5.5037	0.0024736	out	8781 8782 8781	1	29	25	1.5e-16	5.2e-18
2451	5.5062	0.0024736	out	8783 8784 8783	1	29	25	5.2e-15	6.3e-17
2452	5.5086	0.0024736	out	8785 8786 8785	1	29	25	6.5e-15	3.4e-17
2453	5.5111	0.0024736	out	8787 8788 8787	1	29	25	1.5e-15	1.5e-17
2454	5.5136	0.0024736	out	8789 8790 8789	1	29	25	2.8e-15	2.1e-17
2455	5.516	0.0024736	out	8791 8792 8791	1	29	25	4.9e-15	4e-17
2456	5.5185	0.0024736	out	8793 8794 8793	1	29	25	3.5e-15	2.7e-17
2457	5.521	0.0024736	out	8795 8796 8795	1	29	25	2.1e-15	7.6e-18
2458	5.5235	0.0024736	out	8797 8798 8797	1	29	25	5.6e-15	2.4e-17
2459	5.5259	0.0024736	out	8799 8800 8799	1	29	25	6.1e-15	3.5e-17
2460	5.5284	0.0024736	out	8801 8802 8801	1	29	25	5.1e-15	2.4e-17
2461	5.5309	0.0024736	out	8803 8804 8803	1	29	25	6.7e-15	5.9e-17
2462	5.5334	0.0024736	out	8805 8806 8805	1	29	25	3.3e-15	1.9e-17
2463	5.5358	0.0024736	out	8807 8808 8807	1	29	25	2.1e-15	7.4e-18
2464	5.5383	0.0024736	out	8809 8810 8809	1	29	25	4.3e-15	1.9e-17
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2466	5.5433	0.0024736	out	8813 8814 8813	1	29	25	4.9e-15	2.2e-17
2467	5.5457	0.0024736	out	8815 8816 8815	1	29	25	8.4e-15	3.1e-17
2468	5.5482	0.0024736	out	8817 8818 8817	1	29	25	4.2e-17	8.8e-18
2469	5.5507	0.0024736	out	8819 8820 8819	1	29	25	5.8e-16	3.3e-18
2470	5.5531	0.0024736	out	8821 8822 8821	1	29	25	4.2e-15	1.6e-17
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2472	5.5581	0.0024736	out	8825 8826 8825	1	29	25	9.1e-16	9.2e-18

2473	5.5606	0.0024736	out	8827 8828 8827	1	29	25	8.2e-16	6.7e-17
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2476	5.568	0.0024736	out	8833 8834 8833	1	29	25	4.5e-15	9.8e-17
2477	5.5705	0.0024736	out	8835 8836 8835	1	29	25	1.2e-14	1e-16
2478	5.5729	0.0024736	out	8837 8838 8837	1	29	25	2.8e-15	5.2e-17
2479	5.5754	0.0024736	out	8839 8840 8839	1	29	25	3.4e-15	3.2e-17
2480	5.5779	0.0024736	out	8841 8842 8841	1	29	25	2.7e-15	4.6e-17
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2485	5.5903	0.0024736	out	8851 8852 8851	1	29	25	4.9e-15	8.9e-16
2486	5.5927	0.0024736	out	8853 8854 8853	1	29	25	9.8e-15	2.3e-16
2487	5.5952	0.0024736	out	8855 8856 8855	1	29	25	7.1e-15	8.7e-17
2488	5.5977	0.0024736	out	8857 8858 8857	1	29	25	2.3e-15	3.4e-17
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2490	5.6026	0.0024736	out	8861 8862 8861	1	29	25	8.6e-16	7.6e-18
2491	5.6051	0.0024736	out	8863 8864 8863	1	29	25	8.6e-16	2.4e-17
2492	5.6076	0.0024736	out	8865 8866 8865	1	29	25	1.1e-14	4.9e-17
2493	5.61	0.0024736	out	8867 8868 8867	1	29	25	5e-15	2.6e-17
2494	5.6125	0.0024736	out	8869 8870 8869	1	29	25	9e-15	2.8e-17
2495	5.615	0.0024736	out	8871 8872 8871	1	29	25	1.8e-15	2.3e-17
2496	5.6175	0.0024736	out	8873 8874 8873	1	29	25	4.4e-15	1.1e-17
2497	5.6199	0.0024736	out	8875 8876 8875	1	29	25	7.7e-15	5.1e-17
2498	5.6224	0.0024736	out	8877 8878 8877	1	29	25	1.1e-16	1.1e-17
2499	5.6249	0.0024736	out	8879 8880 8879	1	29	25	1.2e-15	1e-17
2500	5.6274	0.0024736	out	8881 8882 8881	1	29	25	1.8e-15	6.2e-18
2501	5.6298	0.0024736	out	8883 8884 8883	1	29	25	2.6e-15	1e-17
2502	5.6323	0.0024736	out	8885 8886 8885	1	29	25	5.9e-15	1.7e-17
2503	5.6348	0.0024736	out	8887 8888 8887	1	29	25	2.5e-15	4.5e-18
2504	5.6372	0.0024736	out	8889 8890 8889	1	29	25	9.6e-16	1.4e-17
2505	5.6397	0.0024736	out	8891 8892 8891	1	29	25	6.2e-15	1.1e-17
2506	5.6422	0.0024736	out	8893 8894 8893	1	29	25	2.3e-15	6.7e-18
2507	5.6447	0.0024736	out	8895 8896 8895	1	29	25	5.1e-16	2.1e-17
2508	5.6471	0.0024736	out	8897 8898 8897	1	29	25	3.9e-15	2.4e-17
2509	5.6496	0.0024736	out	8899 8900 8899	1	29	25	1.9e-15	7.2e-18
2510	5.6521	0.0024736	out	8901 8902 8901	1	29	25	5.3e-15	8.7e-18
2511	5.6546	0.0024736	out	8903 8904 8903	1	29	25	4.5e-15	9.8e-18
2512	5.657	0.0024736	out	8905 8906 8905	1	29	25	1.8e-15	3.9e-18
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2515	5.6645	0.0024736	out	8911 8912 8911	1	29	25	3.6e-15	6.1e-18
2516	5.6669	0.0024736	out	8913 8914 8913	1	29	25	5.1e-15	8.8e-18
2517	5.6694	0.0024736	out	8915 8916 8915	1	29	25	7.5e-16	2.4e-18
2518	5.6719	0.0024736	out	8917 8918 8917	1	29	25	3.6e-16	6.3e-18
2519	5.6744	0.0024736	out	8919 8920 8919	1	29	25	6.1e-15	1.3e-17
2520	5.6768	0.0024736	out	8921 8922 8921	1	29	25	2.9e-15	1.2e-17
2521	5.6793	0.0024736	out	8923 8924 8923	1	29	25	1.4e-15	9.6e-18
2522	5.6818	0.0024736	out	8925 8926 8925	1	29	25	2.4e-15	1.3e-17
2523	5.6842	0.0024736	out	8927 8928 8927	1	29	25	1.8e-16	3.2e-18
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2543	5.7337	0.0024736	out	8967 8968 8967	1	29	25	3.3e-15	1.6e-17
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2545	5.7387	0.0024736	out	8971 8972 8971	1	29	25	8.6e-16	9.3e-18
2546	5.7411	0.0024736	out	8973 8974 8973	1	29	25	4.7e-16	1.1e-18
2547	5.7436	0.0024736	out	8975 8976 8975	1	29	25	2e-15	5e-18
2548	5.7461	0.0024736	out	8977 8978 8977	1	29	25	5.6e-15	1.5e-17
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2551	5.7535	0.0024736	out	8983 8984 8983	1	29	25	2.1e-15	4.3e-18
2552	5.756	0.0024736	out	8985 8986 8985	1	29	25	4.4e-16	4.6e-18
2553	5.7585	0.0024736	out	8987 8988 8987	1	29	25	3.1e-15	1.8e-17
2554	5.7609	0.0024736	out	8989 8990 8989	1	29	25	1.1e-15	2.7e-18

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2555    5.7634   0.0024736 out 8991 8992 8991    1    29    25  1.4e-15  3.8e-18
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2557    5.7683   0.0024736 out 8995 8996 8995    1    29    25  3.7e-15  8.4e-18
2558    5.7708   0.0024736 out 8997 8998 8997    1    29    25  1.2e-15  1.1e-17
2559    5.7733   0.0024736 out 8999 9000 8999    1    29    25  3.8e-15  9.4e-18
2560    5.7758   0.0024736 out 9001 9002 9001    1    29    25  1.7e-15  6.1e-18
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2562    5.7807   0.0024736 out 9005 9006 9005    1    29    25  1.3e-15  6.2e-18
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2564    5.7857   0.0024736 out 9009 9010 9009    1    29    25   1e-15  3.7e-18
2565    5.7881   0.0024736 out 9011 9012 9011    1    29    25   2e-15  1.1e-17
2566    5.7906   0.0024736 out 9013 9014 9013    1    29    25  8.1e-15  1.9e-17
2567    5.7931   0.0024736 out 9015 9016 9015    1    29    25  4.4e-15  1.2e-17
2568    5.7956   0.0024736 out 9017 9018 9017    1    29    25  4.2e-15  1.1e-17
2569    5.798    0.0024736 out 9019 9020 9019    1    29    25  5.1e-16  1.6e-17
2570    5.8005   0.0024736 out 9021 9022 9021    1    29    25  1.9e-15  4.9e-18
2571    5.803    0.0024736 out 9023 9024 9023    1    29    25  3.7e-16  3.5e-18
2572    5.8055   0.0024736 out 9025 9026 9025    1    29    25  3.2e-16  4.5e-18
2573    5.8079   0.0024736 out 9027 9028 9027    1    29    25  8.4e-16  1.3e-17
2574    5.8104   0.0024736 out 9029 9030 9029    1    29    25  1.4e-15   8e-18
2575    5.8129   0.0024736 out 9031 9032 9031    1    29    25  2.3e-15  1.1e-17
2576    5.8153   0.0024736 out 9033 9034 9033    1    29    25   5e-16  1.6e-18
2577    5.8178   0.0024736 out 9035 9036 9035    1    29    25  3.1e-16  3.2e-18
2578    5.8203   0.0024736 out 9037 9038 9037    1    29    25  4.2e-16  2.8e-18
2579    5.8228   0.0024736 out 9039 9040 9039    1    29    25  3.9e-15  1.1e-17
2580    5.8252   0.0024736 out 9041 9042 9041    1    29    25  2.9e-16  8.8e-19
2581    5.8277   0.0024736 out 9043 9044 9043    1    29    25  1.7e-15  4.9e-18
2582    5.8302   0.0024736 out 9045 9046 9045    1    29    25  2.2e-15  6.5e-18
2583    5.8327   0.0024736 out 9047 9048 9047    1    29    25  4.3e-15  1.3e-17
2584    5.8351   0.0024736 out 9049 9050 9049    1    29    25  2.5e-15  7.6e-18
2585    5.8376   0.0024736 out 9051 9052 9051    1    29    25   4e-15  1.2e-17
2586    5.8401   0.0024736 out 9053 9054 9053    1    29    25  1.2e-15  4.7e-18
2587    5.8426   0.0024736 out 9055 9056 9055    1    29    25  2.4e-15  2.2e-17
2588    5.845    0.0024736 out 9057 9058 9057    1    29    25  1.6e-15  1.3e-17
2589    5.8475   0.0024736 out 9059 9060 9059    1    29    25  5.2e-15  1.6e-17
2590    5.85     0.0024736 out 9061 9062 9061    1    29    25  3.1e-15  9.8e-18
2591    5.8524   0.0024736 out 9063 9064 9063    1    29    25  2.3e-15  1.8e-17
2592    5.8549   0.0024736 out 9065 9066 9065    1    29    25  2.4e-15  1.4e-17
2593    5.8574   0.0024736 out 9067 9068 9067    1    29    25   3e-15   1e-17
2594    5.8599   0.0024736 out 9069 9070 9069    1    29    25   2e-15  8.2e-18
2595    5.8623   0.0024736 out 9071 9072 9071    1    29    25  1.7e-15  6.6e-18
2596    5.8648   0.0024736 out 9073 9074 9073    1    29    25  2.4e-15  9.8e-18
2597    5.8673   0.0024736 out 9075 9076 9075    1    29    25  6.4e-17  1.6e-17
2598    5.8698   0.0024736 out 9077 9078 9077    1    29    25  1.6e-15  7.8e-18
2599    5.8722   0.0024736 out 9079 9080 9079    1    29    25  5.5e-16  8.4e-18
2600    5.8747   0.0024736 out 9081 9082 9081    1    29    25  1.3e-15   5e-18
2601    5.8772   0.0024736 out 9083 9084 9083    1    29    25  4.3e-15  1.6e-17
2602    5.8797   0.0024736 out 9085 9086 9085    1    29    25  2.7e-17  5.1e-18
2603    5.8821   0.0024736 out 9087 9088 9087    1    29    25  1.4e-15   1e-17
2604    5.8846   0.0024736 out 9089 9090 9089    1    29    25  2.5e-18  1.5e-18
2605    5.8871   0.0024736 out 9091 9092 9091    1    29    25  1.8e-15  1.5e-17
2606    5.8896   0.0024736 out 9093 9094 9093    1    29    25  2.3e-15  1.2e-17
2607    5.892    0.0024736 out 9095 9096 9095    1    29    25  3.1e-15  1.5e-17
2608    5.8945   0.0024736 out 9097 9098 9097    1    29    25  5.8e-15  2.1e-17
2609    5.897    0.0024736 out 9099 9100 9099    1    29    25   1e-15  2.3e-17
2610    5.8994   0.0024736 out 9101 9102 9101    1    29    25  3.8e-15  1.3e-17
2611    5.9019   0.0024736 out 9103 9104 9103    1    29    25  1.4e-15  6.5e-18
2612    5.9044   0.0024736 out 9105 9106 9105    1    29    25  6.8e-16  8.3e-18
2613    5.9069   0.0024736 out 9107 9108 9107    1    29    25  1.3e-15   7e-18
2614    5.9093   0.0024736 out 9109 9110 9109    1    29    25  2.2e-15  2.7e-17
2615    5.9118   0.0024736 out 9111 9112 9111    1    29    25  1.4e-15  2.2e-17
2616    5.9143   0.0024736 out 9113 9114 9113    1    29    25  8.4e-16  4.5e-18
2617    5.9168   0.0024736 out 9115 9116 9115    1    29    25  4.8e-15  1.7e-17
2618    5.9192   0.0024736 out 9117 9118 9117    1    29    25  4.3e-16   3e-18
2619    5.9217   0.0024736 out 9119 9120 9119    1    29    25  2.1e-15  1.6e-17
2620    5.9242   0.0024736 out 9121 9122 9121    1    29    25  2.1e-15  7.7e-18
2621    5.9267   0.0024736 out 9123 9124 9123    1    29    25  2.3e-15  7.7e-18
2622    5.9291   0.0024736 out 9125 9126 9125    1    29    25  3.4e-17  1.3e-17
2623    5.9316   0.0024736 out 9127 9128 9127    1    29    25  3.7e-15  2.3e-17
2624    5.9341   0.0024736 out 9129 9130 9129    1    29    25  1.9e-16  3.9e-18
2625    5.9366   0.0024736 out 9131 9132 9131    1    29    25  1.6e-15  7.4e-18
2626    5.939    0.0024736 out 9133 9134 9133    1    29    25  3.9e-15  1.2e-17
2627    5.9415   0.0024736 out 9135 9136 9135    1    29    25  1.9e-16  1.4e-17
2628    5.944    0.0024736 out 9137 9138 9137    1    29    25  1.1e-15  1.7e-17
2629    5.9464   0.0024736 out 9139 9140 9139    1    29    25  2.4e-17  6.1e-18
2630    5.9489   0.0024736 out 9141 9142 9141    1    29    25  1.4e-15  1.4e-17
2631    5.9514   0.0024736 out 9143 9144 9143    1    29    25  4.7e-16  7.3e-18
2632    5.9539   0.0024736 out 9145 9146 9145    1    29    25  2.9e-16  8.6e-18
2633    5.9563   0.0024736 out 9147 9148 9147    1    29    25  1.3e-15  7.7e-18
2634    5.9588   0.0024736 out 9149 9150 9149    1    29    25  1.6e-15  4.7e-18
2635    5.9613   0.0024736 out 9151 9152 9151    1    29    25  1.6e-15  9.5e-18
2636    5.9638   0.0024736 out 9153 9154 9153    1    29    25  7.2e-16  3.4e-18
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2637   5.9662   0.0024736 out 9155 9156 9155   1   29   25  3.4e-15  1.2e-17
2638   5.9687   0.0024736 out 9157 9158 9157   1   29   25  9.3e-16  6.4e-18
2639   5.9712   0.0024736 out 9159 9160 9159   1   29   25  2.6e-15  1.3e-17
2640   5.9737   0.0024736 out 9161 9162 9161   1   29   25  6.7e-16  1.2e-17
2641   5.9761   0.0024736 out 9163 9164 9163   1   29   25  1.3e-15  3.4e-18
2642   5.9786   0.0024736 out 9165 9166 9165   1   29   25  2.5e-15  7.9e-18
2643   5.9811   0.0024736 out 9167 9168 9167   1   29   25  4.1e-15  1.1e-17
2644   5.9835   0.0024736 out 9169 9170 9169   1   29   25   9e-16   2.1e-18
2645   5.986    0.0024736 out 9171 9172 9171   1   29   25  2.5e-15   6e-18
2646   5.9885   0.0024736 out 9173 9174 9173   1   29   25  8.3e-16  1.2e-17
2647   5.991    0.0024736 out 9175 9176 9175   1   29   25  6.4e-15  1.9e-17
2648   5.9934   0.0024736 out 9177 9178 9177   1   29   25   4e-15   1.4e-17
2649   5.9959   0.0024736 out 9179 9180 9179   1   29   25  1.6e-16  1.2e-17
2650   5.9984   0.0024736 out 9181 9182 9181   1   29   25  1.8e-15  7.6e-18
2651   6.0009   0.0024736 out 9183 9184 9183   1   29   25  1.6e-15  3.6e-18
2652   6.0033   0.0024736 out 9185 9186 9185   1   29   25  4.2e-15  9.8e-18
2653   6.0058   0.0024736 out 9187 9188 9187   1   29   25  7.1e-15  2.2e-17
```
Time-stepping completed.
Solution time: 522 s. (8 minutes, 42 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

v0=3.5 (su6)

General

Description	Value
Solution	v0=3.5 (sol8)

Log
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```
2212   4.4076   0.0023101 out 5900 5901 5900   3   41   27  1.3e-14  1.4e-14
2213   4.41     0.0023101 out 5901 5902 5901   3   41   27  4.5e-16  5.2e-15
2214   4.4123   0.0023101 out 5902 5903 5902   3   41   27  9.2e-16  3.7e-15
2215   4.4146   0.0023101 out 5903 5904 5903   3   41   27  8.1e-15  1.2e-14
2216   4.4169   0.0023101 out 5904 5905 5904   3   41   27  3.6e-15  1.1e-14
2217   4.4192   0.0023101 out 5905 5906 5905   3   41   27   2e-15   1.9e-15
2218   4.4215   0.0023101 out 5906 5907 5906   3   41   27  1.3e-15  4.5e-15
2219   4.4238   0.0023101 out 5907 5908 5907   3   41   27  1.6e-15  1.5e-14
2220   4.4261   0.0023101 out 5908 5909 5908   3   41   27  4.9e-15   1e-14
2221   4.4284   0.0023101 out 5909 5910 5909   3   41   27  3.9e-15  1.1e-14
2222   4.4307   0.0023101 out 5910 5911 5910   3   41   27  2.4e-15  2.8e-15
2223   4.4331   0.0023101 out 5911 5912 5911   3   41   27  2.9e-15  3.4e-15
2224   4.4354   0.0023101 out 5912 5913 5912   3   41   27  3.6e-15  7.1e-15
2225   4.4377   0.0023101 out 5913 5914 5913   3   41   27   2e-15   1.2e-14
2226   4.44     0.0023101 out 5914 5915 5914   3   41   27  2.4e-15  1.8e-14
2227   4.4423   0.0023101 out 5915 5916 5915   3   41   27  7.5e-15   8e-15
2228   4.4446   0.0023101 out 5916 5917 5916   3   41   27   8e-16   9.4e-16
2229   4.4469   0.0023101 out 5917 5918 5917   3   41   27  1.9e-16  1.5e-14
2230   4.4492   0.0023101 out 5918 5919 5918   3   41   27  4.3e-15  1.2e-14
2231   4.4515   0.0023101 out 5919 5920 5919   3   41   27   6e-15   6.6e-15
2232   4.4538   0.0023101 out 5920 5921 5920   3   41   27  2.4e-15  5.2e-15
2233   4.4562   0.0023101 out 5921 5922 5921   3   41   27  6.5e-16  9.8e-15
2234   4.4585   0.0023101 out 5922 5923 5922   3   41   27  4.7e-15  5.1e-15
2235   4.4608   0.0023101 out 5923 5924 5923   3   41   27  4.1e-16  1.3e-14
2236   4.4631   0.0023101 out 5924 5925 5924   3   41   27  1.2e-15  2.2e-15
2237   4.4654   0.0023101 out 5925 5926 5925   3   41   27  2.3e-15  2.3e-15
2238   4.4677   0.0023101 out 5926 5927 5926   3   41   27  2.5e-15  2.4e-15
2239   4.47     0.0023101 out 5927 5928 5927   3   41   27   2e-15    2e-15
2240   4.4723   0.0023101 out 5928 5929 5928   3   41   27  1.2e-14  1.2e-14
2241   4.4746   0.0023101 out 5929 5930 5929   3   41   27  1.5e-15  6.1e-15
2242   4.477    0.0023101 out 5930 5931 5930   3   41   27  8.3e-15  8.4e-15
2243   4.4793   0.0023101 out 5931 5932 5931   3   41   27  5.9e-15   1e-14
2244   4.4816   0.0023101 out 5932 5933 5932   3   41   27  4.4e-15  7.2e-15
2245   4.4839   0.0023101 out 5933 5934 5933   3   41   27   9e-15   8.8e-15
2246   4.4862   0.0023101 out 5934 5935 5934   3   41   27  9.9e-15  1.2e-14
2247   4.4885   0.0023101 out 5935 5936 5935   3   41   27  2.6e-15  2.8e-15
2248   4.4908   0.0023101 out 5936 5937 5936   3   41   27  1.3e-14  1.7e-14
2249   4.4931   0.0023101 out 5937 5938 5937   3   41   27  1.3e-15  2.2e-15
2250   4.4954   0.0023101 out 5938 5939 5938   3   41   27   2e-15   9.1e-15
2251   4.4977   0.0023101 out 5939 5940 5939   3   41   27  7.1e-15  7.5e-15
2252   4.5001   0.0023101 out 5940 5941 5940   3   41   27  1.9e-15  1.9e-15
2253   4.5024   0.0023101 out 5941 5942 5941   3   41   27  2.7e-15  3.7e-15
2254   4.5047   0.0023101 out 5942 5943 5942   3   41   27  2.2e-15  4.5e-15
2255   4.507    0.0023101 out 5943 5944 5943   3   41   27  6.6e-15  7.5e-15
2256   4.5093   0.0023101 out 5944 5945 5944   3   41   27  8.4e-15  1.4e-14
2257   4.5116   0.0023101 out 5945 5946 5945   3   41   27  4.4e-15  4.5e-15
2258   4.5139   0.0023101 out 5946 5947 5946   3   41   27  8.6e-15  1.1e-14
2259   4.5162   0.0023101 out 5947 5948 5947   3   41   27  1.8e-15   2e-15
2260   4.5185   0.0023101 out 5948 5949 5948   3   41   27  6.7e-15  6.5e-15
2261   4.5208   0.0023101 out 5949 5950 5949   3   41   27  8.5e-16  3.9e-15
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2262    4.5232  0.0023101 out 5950 5951 5950    3    41    27 7.1e-15 9.3e-15
2263    4.5255  0.0023101 out 5951 5952 5951    3    41    27 3.8e-15   4e-15
2264    4.5278  0.0023101 out 5952 5953 5952    3    41    27 1.1e-15 1.7e-14
2265    4.5301  0.0023101 out 5953 5954 5953    3    41    27 5.8e-15   1e-14
2266    4.5324  0.0023101 out 5954 5955 5954    3    41    27  6e-15   1e-14
2267    4.5347  0.0023101 out 5955 5956 5955    3    41    27  6e-15 5.8e-15
2268    4.537   0.0023101 out 5956 5957 5956    3    41    27 4.7e-15 5.1e-15
2269    4.5393  0.0023101 out 5957 5958 5957    3    41    27 4.4e-15 7.4e-15
2270    4.5416  0.0023101 out 5958 5959 5958    3    41    27 8.4e-16 1.5e-14
2271    4.5439  0.0023101 out 5959 5960 5959    3    41    27 2.5e-15 2.5e-15
2272    4.5463  0.0023101 out 5960 5961 5960    3    41    27 5.3e-16 5.2e-15
2273    4.5486  0.0023101 out 5961 5962 5961    3    41    27 2.1e-15 1.2e-14
2274    4.5509  0.0023101 out 5962 5963 5962    3    41    27 1.1e-15 6.2e-15
2275    4.5532  0.0023101 out 5963 5964 5963    3    41    27 3.7e-15 3.8e-15
2276    4.5555  0.0023101 out 5964 5965 5964    3    41    27 6.4e-15 6.3e-15
2277    4.5578  0.0023101 out 5965 5966 5965    3    41    27 7.6e-16 2.3e-15
2278    4.5601  0.0023101 out 5966 5967 5966    3    41    27 1.4e-15 1.6e-14
2279    4.5624  0.0023101 out 5967 5968 5967    3    41    27 4.9e-16 4.7e-15
2280    4.5647  0.0023101 out 5968 5969 5968    3    41    27 1.2e-14 1.4e-14
2281    4.567   0.0023101 out 5969 5970 5969    3    41    27  6e-15 5.8e-15
2282    4.5694  0.0023101 out 5970 5971 5970    3    41    27 3.9e-15 9.2e-15
2283    4.5717  0.0023101 out 5971 5972 5971    3    41    27 2.8e-15 3.8e-15
2284    4.574   0.0023101 out 5972 5973 5972    3    41    27 1.4e-15 1.8e-15
2285    4.5763  0.0023101 out 5973 5974 5973    3    41    27  3e-15 3.2e-15
2286    4.5786  0.0023101 out 5974 5975 5974    3    41    27 6.1e-15 6.5e-15
2287    4.5809  0.0023101 out 5975 5976 5975    3    41    27 8.9e-15 1.1e-14
2288    4.5832  0.0023101 out 5976 5977 5976    3    41    27 5.1e-15 6.1e-15
2289    4.5855  0.0023101 out 5977 5978 5977    3    41    27 6.7e-15 6.8e-15
2290    4.5878  0.0023101 out 5978 5979 5978    3    41    27 2.6e-15 2.9e-15
2291    4.5901  0.0023101 out 5979 5980 5979    3    41    27 6.3e-16 8.2e-15
2292    4.5925  0.0023101 out 5980 5981 5980    3    41    27 1.9e-15 5.7e-15
2293    4.5948  0.0023101 out 5981 5982 5981    3    41    27 1.4e-15 7.4e-15
2294    4.5971  0.0023101 out 5982 5983 5982    3    41    27 4.9e-15 1.1e-14
2295    4.5994  0.0023101 out 5983 5984 5983    3    41    27 4.3e-15 9.1e-15
2296    4.6017  0.0023101 out 5984 5985 5984    3    41    27 2.8e-15 1.2e-14
2297    4.604   0.0023101 out 5985 5986 5985    3    41    27 9.3e-16 1.7e-15
2298    4.6063  0.0023101 out 5986 5987 5986    3    41    27 8.9e-15   1e-14
2299    4.6086  0.0023101 out 5987 5988 5987    3    41    27 7.6e-15 8.1e-15
2300    4.6109  0.0023101 out 5988 5989 5988    3    41    27 1.2e-14 1.3e-14
2301    4.6132  0.0023101 out 5989 5990 5989    3    41    27 2.4e-15 9.6e-15
2302    4.6156  0.0023101 out 5990 5991 5990    3    41    27 7.9e-15 1.7e-14
2303    4.6179  0.0023101 out 5991 5992 5991    3    41    27 4.9e-15 5.3e-15
2304    4.6202  0.0023101 out 5992 5993 5992    3    41    27 5.3e-15 7.8e-15
2305    4.6225  0.0023101 out 5993 5994 5993    3    41    27 1.3e-15 3.6e-15
2306    4.6248  0.0023101 out 5994 5995 5994    3    41    27 2.5e-15 4.3e-15
2307    4.6271  0.0023101 out 5995 5996 5995    3    41    27 4.5e-15 4.4e-15
2308    4.6294  0.0023101 out 5996 5997 5996    3    41    27 1.4e-15 2.5e-15
2309    4.6317  0.0023101 out 5997 5998 5997    3    41    27 7.5e-17 3.1e-15
2310    4.634   0.0023101 out 5998 5999 5998    3    41    27 3.8e-15 6.6e-15
2311    4.6363  0.0023101 out 5999 6000 5999    3    41    27 1.5e-15 5.3e-15
2312    4.6387  0.0023101 out 6000 6001 6000    3    41    27 4.1e-15 4.4e-15
2313    4.641   0.0023101 out 6001 6002 6001    3    41    27 1.5e-15 1.5e-15
2314    4.6433  0.0023101 out 6002 6003 6002    3    41    27 5.6e-16 5.3e-15
2315    4.6456  0.0023101 out 6003 6004 6003    3    41    27 2.4e-15 6.3e-15
2316    4.6479  0.0023101 out 6004 6005 6004    3    41    27 3.3e-15 3.2e-15
2317    4.6502  0.0023101 out 6005 6006 6005    3    41    27 5.9e-15 6.7e-15
2318    4.6525  0.0023101 out 6006 6007 6006    3    41    27  8e-15 7.9e-15
2319    4.6548  0.0023101 out 6007 6008 6007    3    41    27 6.6e-15 8.9e-15
2320    4.6571  0.0023101 out 6008 6009 6008    3    41    27 3.1e-15 4.7e-15
2321    4.6594  0.0023101 out 6009 6010 6009    3    41    27 1.7e-15 8.8e-15
2322    4.6618  0.0023101 out 6010 6011 6010    3    41    27 4.9e-15 4.9e-15
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2324    4.6664  0.0023101 out 6012 6013 6012    3    41    27 1.1e-15 4.7e-15
2325    4.6687  0.0023101 out 6013 6014 6013    3    41    27 9.4e-15 1.3e-14
2326    4.671   0.0023101 out 6014 6015 6014    3    41    27  1e-14 1.3e-14
2327    4.6733  0.0023101 out 6015 6016 6015    3    41    27 5.5e-16   6e-15
2328    4.6756  0.0023101 out 6016 6017 6016    3    41    27  4e-16 3.6e-15
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2331    4.6825  0.0023101 out 6019 6020 6019    3    41    27 2.6e-15 2.6e-15
2332    4.6849  0.0023101 out 6020 6021 6020    3    41    27 2.2e-15 1.4e-14
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2336    4.6941  0.0023101 out 6024 6025 6024    3    41    27 8.4e-16 3.9e-15
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2340    4.7033  0.0023101 out 6028 6029 6028    3    41    27 5.9e-15 7.2e-15
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2346    4.7172   0.0023101 out 6034 6035 6034    3   41    27  3.3e-15  1.1e-14
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2367    4.7657   0.0023101 out 6055 6056 6055    3   41    27  9.4e-17  7.8e-15
2368    4.768    0.0023101 out 6056 6057 6056    3   41    27  2.2e-16  1.5e-14
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2500    5.073   0.0023101 out 6188 6189 6188   3   41    27  4.8e-15  6.9e-15
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2521   5.1215   0.0023101 out 6209 6210 6209   3   41   27 9.9e-15  1e-14
2522   5.1238   0.0023101 out 6210 6211 6210   3   41   27 1.5e-15 2.9e-15
2523   5.1261   0.0023101 out 6211 6212 6211   3   41   27 5.3e-15 6.7e-15
2524   5.1284   0.0023101 out 6212 6213 6212   3   41   27  1e-15   7e-15
2525   5.1307   0.0023101 out 6213 6214 6213   3   41   27 5.1e-15 5.2e-15
2526   5.133    0.0023101 out 6214 6215 6214   3   41   27 7.6e-15 1.2e-14
2527   5.1353   0.0023101 out 6215 6216 6215   3   41   27 1.3e-14 1.7e-14
2528   5.1376   0.0023101 out 6216 6217 6216   3   41   27 2.8e-15 1.2e-14
2529   5.1399   0.0023101 out 6217 6218 6217   3   41   27 1.3e-15 1.8e-14
2530   5.1423   0.0023101 out 6218 6219 6218   3   41   27 1.3e-14 1.6e-14
2531   5.1446   0.0023101 out 6219 6220 6219   3   41   27 4.8e-15 8.1e-15
2532   5.1469   0.0023101 out 6220 6221 6220   3   41   27 1.2e-14 1.7e-14
2533   5.1492   0.0023101 out 6221 6222 6221   3   41   27 3.5e-15 4.7e-15
2534   5.1515   0.0023101 out 6222 6223 6222   3   41   27 1.3e-14 1.6e-14
2535   5.1538   0.0023101 out 6223 6224 6223   3   41   27 1.4e-15 6.1e-15
2536   5.1561   0.0023101 out 6224 6225 6224   3   41   27 6.1e-15 1.1e-14
2537   5.1584   0.0023101 out 6225 6226 6225   3   41   27 4.5e-15 4.4e-15
2538   5.1607   0.0023101 out 6226 6227 6226   3   41   27  3e-16 3.1e-15
2539   5.163    0.0023101 out 6227 6228 6227   3   41   27 8.7e-15 1.9e-14
2540   5.1654   0.0023101 out 6228 6229 6228   3   41   27 1.7e-15 8.4e-15
2541   5.1677   0.0023101 out 6229 6230 6229   3   41   27 1.4e-14 1.4e-14
2542   5.17     0.0023101 out 6230 6231 6230   3   41   27 8.9e-15 8.6e-15
2543   5.1723   0.0023101 out 6231 6232 6231   3   41   27 4.5e-15  1e-14
2544   5.1746   0.0023101 out 6232 6233 6232   3   41   27 9.1e-15 1.8e-14
2545   5.1769   0.0023101 out 6233 6234 6233   3   41   27 3.5e-15  5e-15
2546   5.1792   0.0023101 out 6234 6235 6234   3   41   27 4.8e-15 6.6e-15
2547   5.1815   0.0023101 out 6235 6236 6235   3   41   27 1.1e-14 1.1e-14
2548   5.1838   0.0023101 out 6236 6237 6236   3   41   27 1.4e-15 1.5e-15
2549   5.1861   0.0023101 out 6237 6238 6237   3   41   27 1.7e-14 1.7e-14
2550   5.1885   0.0023101 out 6238 6239 6238   3   41   27 2.1e-16 1.1e-14
2551   5.1908   0.0023101 out 6239 6240 6239   3   41   27 9.6e-15  2e-14
2552   5.1931   0.0023101 out 6240 6241 6240   3   41   27 8.5e-15 1.4e-14
2553   5.1954   0.0023101 out 6241 6242 6241   3   41   27  9e-15 8.7e-15
2554   5.1977   0.0023101 out 6242 6243 6242   3   41   27 3.3e-15 3.6e-15
2555   5.2      0.0023101 out 6243 6244 6243   3   41   27 1.9e-15 3.9e-15
2556   5.2023   0.0023101 out 6244 6245 6244   3   41   27 1.6e-15 3.6e-14
2557   5.2046   0.0023101 out 6245 6246 6245   3   41   27 2.2e-15 5.9e-15
2558   5.2069   0.0023101 out 6246 6247 6246   3   41   27 8.7e-15 8.7e-15
2559   5.2092   0.0023101 out 6247 6248 6247   3   41   27 1.4e-14 1.5e-14
2560   5.2116   0.0023101 out 6248 6249 6248   3   41   27  4e-15 1.6e-14
2561   5.2139   0.0023101 out 6249 6250 6249   3   41   27 9.4e-16 9.2e-16
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Time-stepping completed.
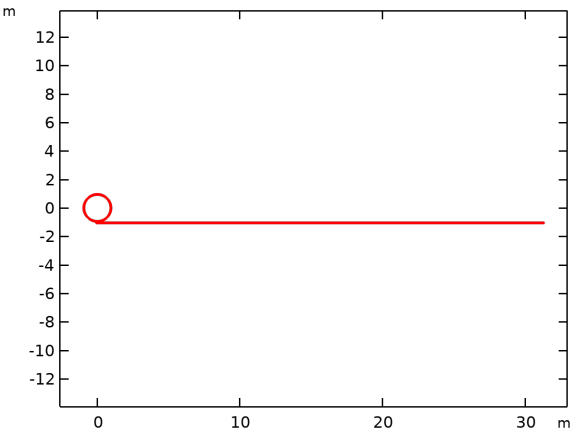Solution time: 334 s. (5 minutes, 34 seconds)

----- Time-Dependent Solver 1 in Study 1/Solution 1 (sol1) -------------------->

4. Results

4.1. Datasets

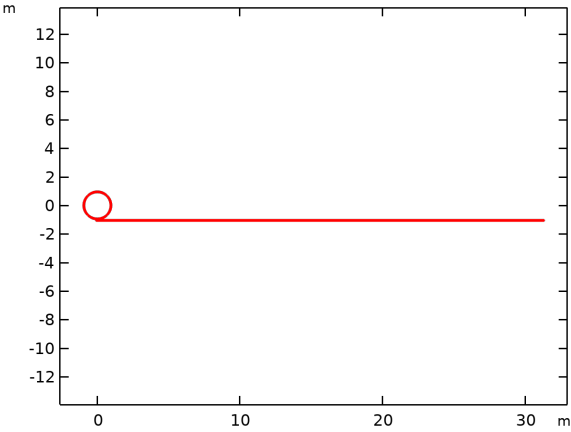### 4.1.1. Study 1/Solution 1

Solution

Description	Value
Solution	Solution 1 (sol1)
Component	Component 1 (comp1)

Dataset: Study 1/Solution 1

4.1.2. Study 1/Parametric Solutions 1

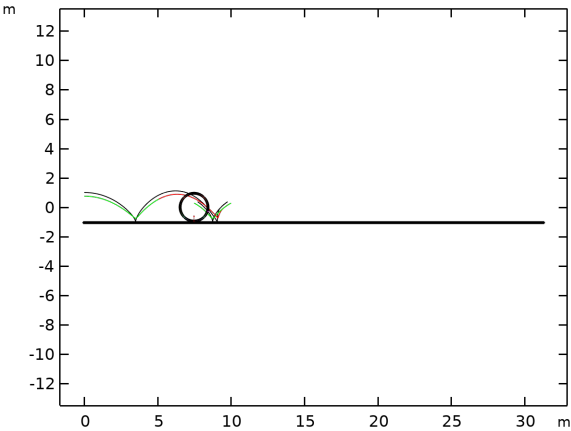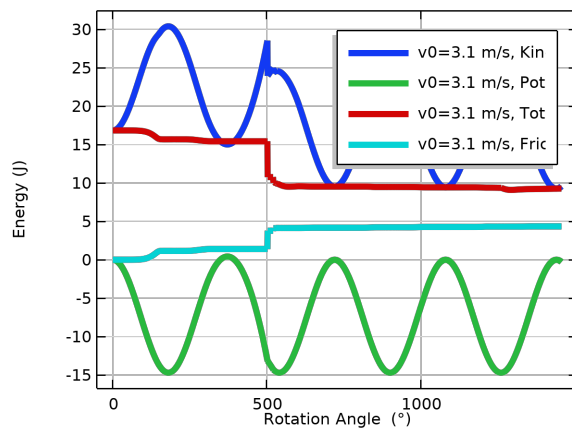|	Solution
Description	**Value**
Solution	Parametric Solutions 1 (sol2)
Component	Component 1 (comp1)

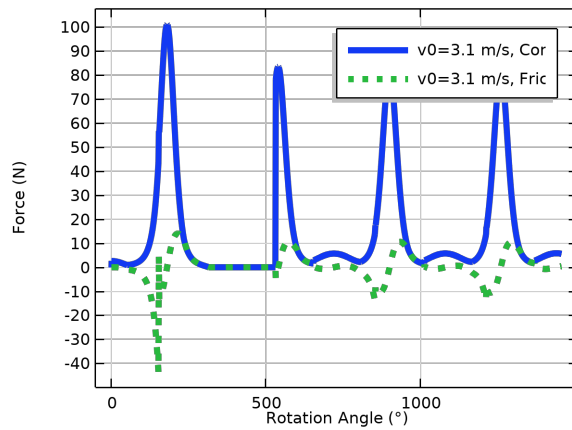*Dataset: Study 1/Parametric Solutions 1*

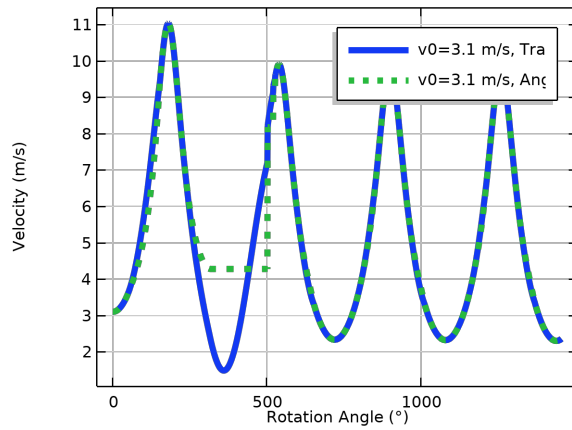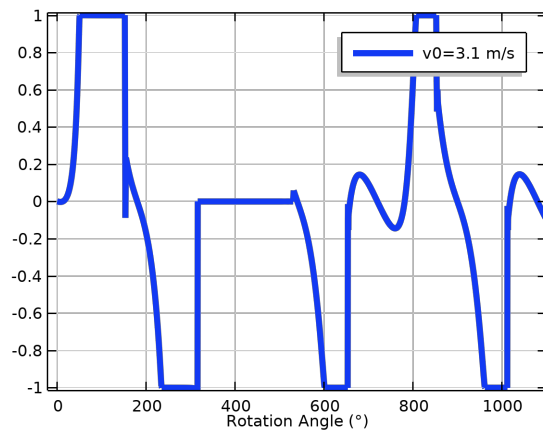### 4.2. Plot Groups

4.2.1. Displacement (mbd)

4.2.2. Energy

4.2.3. Contact Forces

4.2.4. Velocity

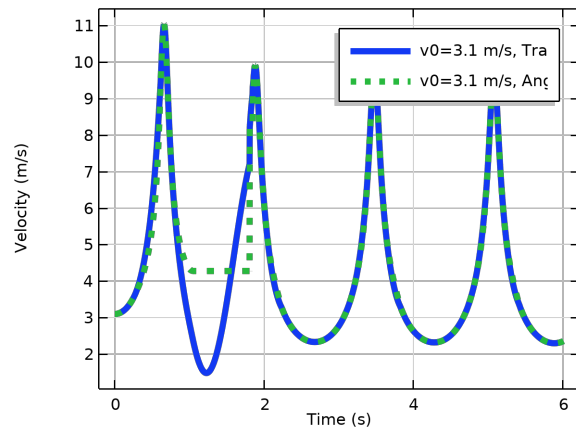### 4.2.5. Friction Utilization Factor

4.2.6. Velocity vs. Time

4.2.7. Energy vs. Time